The Research Council of Norway (NFR)

NORSAR

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Semiannual Technical Summary

1 April - 30 September 1994

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Abstract (cont.)

This Semiannual Report also presents statistics from operation of the Intelligent Monitoring System (IMS). The IMS has been operated in an experimental mode, with continuous automatic detection and location and with analyst review of selected events of interest. Since October 1991, a new version of the IMS that accepts data from an arbitrary number of arrays and single 3-component stations has been operated.

The NORSAR Detection Processing system has been operated throughout the period with an average uptime of 99.3% as compared to 98.3% for the previous reporting period. A total of 2015 seismic events have been reported in the NORSAR monthly seismic bulletin. The performance of the continuous alarm system and the automatic bulletin transfer by telex to AFTAC has been satisfactory. The system for direct retrieval of NORSAR waveform data through an X.25 connection has been used successfully for acquiring such data by AFTAC. Processing of requests for full NORSAR and regional array data on magnetic tapes has progressed according to established schedules.

Since 1 October 1991, an effort has been undertaken to carry out a complete technical refurbishment of the NORSAR array. This project is funded jointly by AFTAC, ARPA and NFR. During the reporting period, all the new Science Horizons data acquisition hardware and software have been acquired and delivered. See NORSAR Sci. Rep. No. 2-93/94 for a system description. The data acquisition software XAVE and communication interface module CIM II were installed on 5 October 1994 at NDPC. At subarray 06C, a CIM II was installed in the Central Terminal Vault -- CTV -- and an AIM24-1 has been installed in one remote SP vault (SPV) for testing purposes. The data acquisition is running satisfactorily. Contractual arrangements for the delivery of “posthole” KS54000 seismometers have been completed.

As an intermediate step in the NORSAR Refurbishment, a modified version of the NORSAR data acquisition system was implemented on 1 January 1994. This modified version has continued to be in operation during the reporting period. The main reason for this change, which utilizes a previously established backup solution, was to circumvent some data timing problems due to deteriorating hardware. At the same time, this change has provided valuable experience in preparing the full refurbishment.

On-line detection processing and data recording at the NORSAR Data Processing Center (NDPC) of NORESS, ARCESS, FINESS and GERESS data have been conducted throughout the period. Data from two experimental small-aperture arrays at sites in Spitsbergen and Apatity, Kola Peninsula, have been recorded and processed in an experimental mode. Monthly processing statistics for the arrays as well as results of the IMS analysis for the reporting period are given.

Maintenance activities in the period comprise preventive/corrective maintenance in connection with all the NORSAR subarrays, NORESS and ARCESS. Other activities have involved testing of the NORSAR communications systems, preparations for the NORSAR refurbishment and work in connection with the experimental small-aperture arrays in Spitsbergen and Russia.

Summaries of six scientific contributions are presented in Chapter 7 of this report.

Section 7.1 is a final report on the global continuous Threshold Monitoring project, which is an effort to develop and implement a prototype, workstation-based Threshold Monitoring System for the GSETT-3 International Data Center (IDC). The main focus of this work has been to develop an environment that facilitates both real-time operation as well as testing of new ideas in the context of continuous seismic threshold monitoring. The current operational system is not fully optimized with respect to processing parameters, but the framework for a stepwise improvement exists. We can as of today demonstrate the potentials of using continuous seismic threshold monitoring as part of a global seismic verification system, but some caution has to be taken during the interpretation of the derived magnitude thresholds. Further improvements will rely heavily on the possibility of conducting extensive event analysis and associated calibration efforts.

Section 7.2 presents observations of the Lop Nor nuclear explosions of 10 June and 7 October 1994. Some comparisons are also made with the Lop Nor explosions conducted on 21 May 1992 and 5 October 1993. Most of the automatic systems at NORSAR showed good performance for these events. Particularly impressive is the high signal-to-noise ratios observed at NORESS and ARCESS. Among the available sources, the most accurate location is provided by the PDE bulletin, which uses a world-wide network for location purposes. The solutions by the Intelligent Monitoring System (IMS), both automatic and after analyst processing, are also quite satisfactory. The NORSAR automatic location was acceptable for only one of the two events, but reruns gave adequate results for both.

Section 7.3 describes the results of a study to investigate the benefits of NORSAR-NORESS joint processing. As is well known, the teleseismic NORSAR array and the regional NORESS array have to some extent overlapping capabilities as far as seismic event detection is concerned. However, when it comes to locating events, the two arrays are complementary. NORSAR has a superior location capability for teleseismic events, whereas NORESS is superior for locating local and regional events. Furthermore, NORESS has the ability to unambiguously classify an event as "regional" or "local", whereas NORSAR will usually assign a teleseismic location estimate (the "best beam") to any event, whether it is of local, regional or teleseismic origin.

The study has shown that a clear improvement in the automatic NORSAR processing can be achieved by combining NORSAR and NORESS. By a simple masking algorithm, most of the NORSAR detected local and regional events can be identified as such using NORESS data. Furthermore, NORESS complements NORSAR by giving an "independent" confirmation of the majority of teleseismic phases. Even further improvements might be possible by joint beamforming techniques, although this has not been attempted in this study.

Section 7.4 contains a study undertaken in cooperation with the Norwegian Institute of International Affairs, and addressing satellite imagery in connection with the Novaya Zemlya northern nuclear test site.

Using Landsat TM images, one craterlike feature was found close to the southwestern mountain slopes of the Matochkin Shar Strait. SPOT panchromatic 10 m resolution

images were purchased, and these revealed three features, most probably craters that were created by underground nuclear explosions. This was unexpectedly confirmed when German aerial photographs of the Matochkin Shar from the summer of 1942 became available. The craters did not show up on these and thus proved that they were formed sometime after 1942.

Three digital SPOT scenes of the Novaya Zemlya northern underground nuclear test site were purchased. The pixel and line coordinates of the crater centers were measured for each of the SPOT scenes. The three separate sets of measurements were combined with their associated ancillary SPOT data. The preliminary results of geographical coordinate determination using this method are presented.

Section 7.5 describes a study of mislocation vectors. To improve the location capabilities of the small aperture arrays (Apatity, ARCESS, FINESS, GERESS, NORESS and Spitsbergen), we compared the results of the automatic fk-analysis (i.e., slowness and azimuth) with theoretically accepted values.

In a first step, we compiled a data base for the time period from 1989 to June 30, 1994, of 157,825 reference events distributed world-wide. The following sources for reference events were used: bulletins of the ISC and NEIC (monthly and weekly), regional bulletins of the seismological institutes in Bergen and in Helsinki, a special bulletin for the Vogtland earthquake swarm region, listings of well-located mining-induced events in Poland, and confirmed quarry blasts in Russia (Kola Peninsula), the Czech Republic and in southern Germany.

For all reference events, theoretical azimuth and slowness values and onset times were calculated using the IASPEI91 tables. All theoretical onsets of local and regional P and S phases and of all teleseismic P-phases were compared with detections and results of the automatic fk-analysis of all arrays.

After carefully checking associations between theoretically expected and observed onsets, 91,290 mislocation vectors could be estimated (Apatity 1,882; ARCESS 29,738; FINESS 15,482; GERESS 17,852; NORESS 26,083; and Spitsbergen 253). Although a large scatter was observed for single mislocations, mean mislocation vectors could be defined and estimated with their standard deviations for all arrays. The mean mislocation vectors can now be used regularly to correct automatically estimated slowness and azimuth values. The corrections and the mean standard deviations of slowness and azimuth will improve the accuracy of event locations from single arrays, GBF and IMS.

Section 7.6 is a follow-up of previous studies of the promising automatic post-processing technique for extremely precise event location in mining regions (exemplified by the Khibiny Massif in the Kola Peninsula). The contribution is directed in particular toward comparing the error ellipses of various approaches, and relating the size of these ellipses to the actual location errors, using a ground-truth data base obtained from the Kola Regional Seismological Centre. The error ellipses are found to be representative both for interactive IMS processing and automatic post-processing, but not in the case of automatic IMS analysis. The main reason in the latter case seems to be that the formal calculation of error ellipses does not take into account effects of occasional erroneous phase identification.

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NORSAR Contribution No. 536

Table of Contents

1 Summary

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2 NORSAR Operation

2.1 Detection Processor (DP) operation

There have been 82 breaks in the otherwise continuous operation of the NORSAR online system within the current 6-month reporting interval. The uptime percentage for the period is 99.3 as compared to 98.3 for the previous period.

Fig. 2.1.1 and the accompanying Table 2.1.1 both show the daily DP downtime for the days between 1 April and 30 September 1994. The monthly recording times and percentages are given in Table 2.1.2.

The breaks can be grouped as follows:

a)	Hardware failure	8
b)	Stops related to program work or error	0
c)	Hardware maintenance stops	0
d)	Power jumps and breaks	0
e)	TOD error correction	0
f)	Communication lines	2

The total downtime for the period was 32 hours and 52 minutes. The mean-time-between-failures (MTBF) was 16.4 days, as compared to 1.4 for the previous period.

J. Torstveit

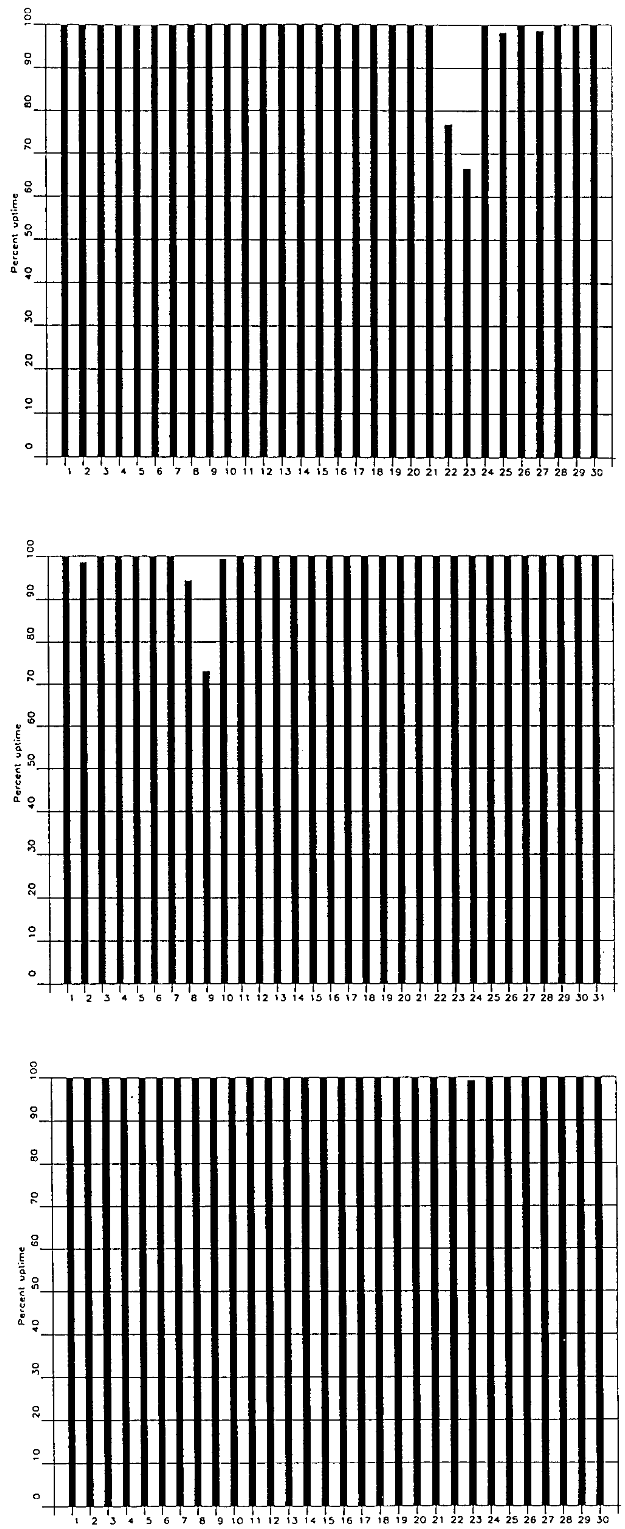

Fig. 2.1.1. Detection Processor uptime for April (top), May (middle) and June (bottom) 1994.

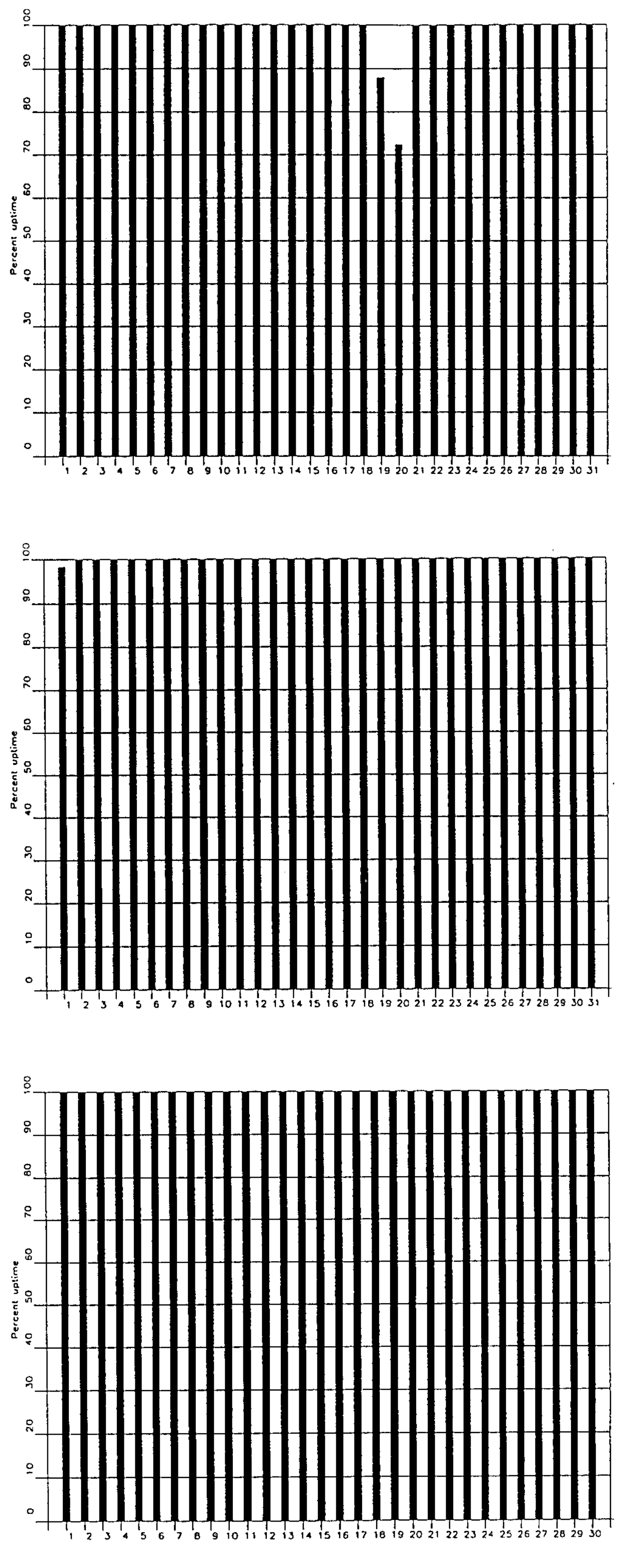

Fig. 2.1.1. Detection Processor uptime for July (top), August (middle) and September (bottom) 1994.

Date	Time	Cause
22 Apr	1827 -	Hardware failure
23 Apr	- 0801	
25 Apr	0803 - 0828	Hardware failure
27 Apr	1051 - 1110	Hardware failure
02 May	0735 - 0750	Hardware failure
02 May	1154 - 1159	Hardware failure
08 May	2239 -	Hardware failure
09 May	- 0627	
10 May	0921 - 0930	Hardware failure
23 Jun	0531 - 0542	Line failure
19 Jul	2106 -	Hardware failure
20 Jul	- 0635	
01 Aug	0948 - 1012	Line failure

Table 2.1.1. The major downtimes in the period 1 April - 30 September 1994.

Month	DP Uptime Hours	DP Uptime %	No. of DP Breaks	No. of Days with Breaks	DP MTBF* (days)
Apr 94	705.67	98.01	3	3	7.4
May 94	731.71	98.88	4	3	6.1
Jun 94	719.78	99.97	1	1	15.0
Jul 94	730.53	98.72	1	1	15.5
Aug 94	739.56	99.94	1	1	15.5
Sep 94	719.93	99.99	0	0	30.0
		99.25	98	63	16.1

*Mean-time-between-failures = total uptime/no. of up intervals.

Table 2.1.2. Online system performance, 1 April - 30 September 1994.

2.2 Array Communications

As described in the previous Semiannual Report, the Modcomp/SLEM-based communication system experienced serious problems toward the end of 1993.

As an intermediate solution, it was decided on 1 January 1994 to implement a backup version of the NORSAR recording system, thus eliminating the Modcomp/SLEM-based recording. This change succeeded in improving both the timing reliability and the individual subarray uptimes.

During the reporting period, the communication lines to all subarrays except 02B and 06C were in operation essentially 100% of the time. Subarrays 02B and 06C were inoperative during the last part of the reporting period in connection with testing and preparation for the NORSAR refurbishment.

The intermediate communication solution will remain in effect until the NORSAR Refurbishment project is completed.

A simplified daily summary of the communications performance for the seven individual subarray lines is summarized, on a month-by-month basis, in Table 2.2.1.

F. Ringdal

Table 2.2.1 (page 1 of 6)
NORSAR Communication Status Report
Month: April 1994

	Subarray						
Day	**01A**	**01B**	**02B**	**02C**	**03C**	**04C**	**06C**
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	I	X	X	X	X
12	X	X	I	X	X	I	X
13	X	X	I	X	X	I	X
14	X	X	I	X	X	I	X
15	X	X	I	X	X	I	X
16	X	X	I	X	X	I	X
17	X	X	I	X	X	I	X
18	X	X	I	X	X	I	X
19	X	X	I	X	X	I	X
20	X	X	I	X	X	X	X
21	X	X	I	X	X	X	X
22	X	X	I	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	720	7200	443	720	720	553	720
% normal operation	100.3	1000	61.5	100	100	76.8	100

Legend :

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (page 2 of 6)
NORSAR Communication Status Report
Month: May 1994

	Subarray						
Day	**01A**	**01B**	**02B**	**02C**	**03C**	**04C**	**06C**
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	744	744	744	744	744	744	744
% normal operation	100	100	100	100	100	100	100

Legend :

X : Normal operations
A : All channels masked for more than 12 hours that day
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I : Communication outage for more than 12 hours

Table 2.2.1 (page 3 of 6)
NORSAR Communication Status Report
Month: June 1994

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31							
Total hours normal operation	720	720	720	720	720	720	720
% normal operation	100	100	100	100	100	100	100

Legend :

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (page 4 of 6)
NORSAR Communication Status Report
Month: July 1994

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	A
02	X	X	X	X	X	X	A
03	X	X	X	X	X	X	A
04	X	X	X	X	X	X	A
05	X	X	X	X	X	X	A
06	X	X	X	X	X	X	A
07	X	X	A	X	X	X	A
08	X	X	A	X	X	X	A
09	X	X	A	X	X	X	A
10	X	X	A	X	X	X	A
11	X	X	A	X	X	X	A
12	X	X	A	X	X	X	A
13	X	X	A	X	X	X	A
14	X	X	A	X	X	X	A
15	X	X	A	X	X	X	A
16	X	X	A	X	X	X	A
17	X	X	A	X	X	X	A
18	X	X	A	X	X	X	A
19	X	X	A	X	X	X	A
20	X	X	A	X	X	X	A
21	X	X	A	X	X	X	A
22	X	X	A	X	X	X	A
23	X	X	A	X	X	X	A
24	X	X	A	X	X	X	A
25	X	X	X	X	X	X	A
26	X	X	X	X	X	X	A
27	X	X	X	X	X	X	A
28	X	X	X	X	X	X	A
29	X	X	X	X	X	X	A
30	X	X	X	X	X	X	A
31	X	X	X	X	X	X	A
Total hours normal operation	744	744	290	744	744	744	0
% normal operation	100	100	39	100	100	100	0

Legend :

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (page 5 of 6)
NORSAR Communication Status Report
Month: August 1994

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	A
02	X	X	X	X	X	X	A
03	X	X	X	X	X	X	A
04	X	X	X	X	X	X	A
05	X	X	X	X	X	X	A
06	X	X	A	X	X	X	A
07	X	X	A	X	X	X	A
08	X	X	A	X	X	X	A
09	X	X	A	X	X	X	A
10	X	X	A	X	X	X	A
11	X	X	A	X	X	X	A
12	X	X	A	X	X	X	A
13	X	X	A	X	X	X	A
14	X	X	A	X	X	X	A
15	X	X	A	X	X	X	A
16	X	X	A	X	X	X	A
17	X	X	A	X	X	X	A
18	X	X	A	X	X	X	A
19	X	X	A	X	X	X	A
20	X	X	A	X	X	X	A
21	X	X	A	X	X	X	A
22	X	X	A	X	X	X	A
23	X	X	A	X	X	X	A
24	X	X	A	X	X	X	A
25	X	X	A	X	X	X	A
26	X	X	A	X	X	X	A
27	X	X	A	X	X	X	A
28	X	X	A	X	X	X	A
29	X	X	A	X	X	X	A
30	X	X	A	X	X	X	A
31	X	X	A	X	X	X	A
Total hours normal operation	744	744	132	744	744	744	0
% normal operation	100	71	18	100	100	100	0

Table 2.2.1 (page 6 of 6)
NORSAR Communication Status Report
Month: September 1994

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	A	X	X	X	A
02	X	X	A	X	X	X	A
03	X	X	A	X	X	X	A
04	X	X	A	X	X	X	A
05	X	X	A	X	X	X	A
06	X	X	A	X	X	X	A
07	X	X	A	X	X	X	A
08	X	X	A	X	X	X	A
09	X	X	A	X	X	X	A
10	X	X	A	X	X	X	A
11	X	X	A	X	X	X	A
12	X	X	A	X	X	X	A
13	X	X	A	X	X	X	A
14	X	X	A	X	X	X	A
15	X	X	A	X	X	X	A
16	X	X	A	X	X	X	A
17	X	X	A	X	X	X	A
18	X	X	A	X	X	X	A
19	X	X	A	X	X	X	A
20	X	X	A	X	X	X	A
21	X	X	A	X	X	X	A
22	X	X	A	X	X	X	A
23	X	X	A	X	X	X	A
24	X	X	A	X	X	X	A
25	X	X	A	X	X	X	A
26	X	X	A	X	X	X	A
27	X	X	A	X	X	X	A
28	X	X	A	X	X	X	A
29	X	X	A	X	X	X	A
30	X	X	A	X	X	X	A
31							
Total hours normal operation	720	720	0	720	720	720	0
% normal operation	100	100	0	100	100	100	0

Legend :

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

2.3 NORSAR Event Detection operation

In Table 2.3.1 some monthly statistics of the Detection and Event Processor operation are given. The table lists the total number of detections (DPX) triggered by the on-line detector, the total number of detections processed by the automatic event processor (EPX) and the total number of events accepted after analyst review (teleseismic phases, core phases and total).

	Total DPX	Total EPX	Accepted events		Sum	Daily
			P-phases	Core Phases		
Apr 94	9670	808	192	66	258	8.6
May 94	6227	751	314	56	370	11.9
Jun 94	8025	861	246	50	296	9.9
Jul 94	6734	1065	242	103	345	11.1
Aug 94	7990	1024	376	60	436	14.1
Sep 94	8970	884	262	48	310	10.3
			1632	383	2015	11.0

Table 2.3.1. Detection and Event Processor statistics, 1 April - 30 September 1994.

NORSAR Detections

The number of detections (phases) reported by the NORSAR detector during day 091, 1994, through day 273, 1994, was 46,071, giving an average of 252 detections per processed day (183 days processed). Table 2.3.2 shows daily and hourly distribution of detections for NORSAR.

B. Paulsen

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	25	25	14	23	22	22	18	15	29	18	20	27	21	17	18	20	30	23	18	23	43	14	19	16	520	Apr 01 Friday
92	13	18	20	25	22	21	15	12	15	14	11	16	16	16	14	31	26	16	23	19	21	24	32	20	460	Apr 02 Saturday
93	23	38	30	31	28	30	19	17	23	29	17	23	10	35	22	17	12	16	19	27	18	19	28	18	549	Apr 03 Sunday
94	18	21	24	17	22	14	17	24	16	22	21	12	19	13	28	9	16	7	18	19	11	24	13	23	428	Apr 04 Monday
95	21	15	5	12	8	5	4	5	7	13	7	8	10	9	12	14	12	11	8	16	7	13	4	18	244	Apr 05 Tuesday
96	19	20	16	16	11	16	4	19	6	11	4	3	21	8	21	3	9	14	19	8	12	18	12	24	314	Apr 06 Wednesday
97	16	18	20	14	12	12	5	6	5	5	2	9	13	3	12	9	12	13	10	8	9	5	6	8	232	Apr 07 Thursday
98	10	22	8	19	18	4	5	4	2	6	3	12	13	13	37	7	8	5	6	15	9	28	14	12	280	Apr 08 Friday
99	15	22	25	24	10	20	16	15	11	14	15	17	13	19	13	21	12	17	15	16	18	16	17	25	406	Apr 09 Saturday
100	17	17	17	17	18	10	15	17	12	8	14	10	8	27	10	5	3	22	5	15	9	18	15	17	326	Apr 10 Sunday
101	19	33	12	24	18	9	5	10	6	6	6	16	10	9	7	3	8	7	14	8	10	10	14	19	283	Apr 11 Monday
102	21	19	23	21	13	4	4	5	2	4	13	16	38	23	18	20	4	7	10	5	10	6	6	11	303	Apr 12 Tuesday
103	22	14	18	15	14	10	9	5	3	11	20	11	7	16	19	11	9	8	17	13	8	21	27	11	319	Apr 13 Wednesday
104	10	14	13	26	10	10	4	11	4	6	9	22	14	7	10	8	5	18	29	9	16	12	10	19	296	Apr 14 Thursday
105	14	12	20	15	13	8	2	10	6	7	0	17	11	15	7	5	2	6	11	13	9	9	15	17	244	Apr 15 Friday
106	16	14	16	18	18	13	16	14	18	15	13	18	13	9	14	24	21	20	28	21	21	16	27	26	429	Apr 16 Saturday
107	31	29	21	28	46	32	20	23	36	13	14	10	12	20	16	12	18	11	11	9	10	16	10	18	466	Apr 17 Sunday
108	16	14	17	18	9	0	2	4	13	8	1	6	9	4	12	3	13	34	12	6	17	8	10	8	244	Apr 18 Monday
109	9	13	5	7	9	2	12	4	7	4	1	11	10	15	21	6	20	13	8	15	3	20	7	24	246	Apr 19 Tuesday
110	29	12	11	7	12	5	11	43	13	9	15	11	10	8	7	13	15	20	16	5	3	14	19	18	326	Apr 20 Wednesday
111	10	15	15	20	24	4	5	4	13	2	2	33	7	16	13	4	6	15	17	8	8	17	16	17	291	Apr 21 Thursday
112	18	13	11	10	4	10	12	19	27	5	8	5	3	12	5	9	13	4	5	0	0	0	0	0	193	Apr 22 Friday
113	0	0	0	0	0	0	0	0	10	6	10	5	8	9	20	17	13	12	18	20	22	20	19	14	223	Apr 23 Saturday
114	13	16	20	20	22	22	19	18	14	14	19	14	10	10	8	9	15	13	5	9	8	10	8	12	328	Apr 24 Sunday
115	30	9	12	13	5	1	3	0	0	7	15	1	13	24	21	2	12	8	4	11	6	4	14	9	224	Apr 25 Monday
116	6	6	10	9	12	1	5	1	2	5	11	9	8	14	8	11	7	20	6	16	16	10	24	33	250	Apr 26 Tuesday
117	15	18	17	18	12	7	4	1	9	12	7	5	8	12	13	7	14	11	10	7	8	8	8	5	236	Apr 27 Wednesday
118	6	9	4	5	7	1	5	5	3	11	2	1	14	15	10	17	8	14	10	10	3	4	10	9	183	Apr 28 Thursday
119	8	9	4	13	5	3	42	44	36	15	1	5	1	10	4	5	4	6	2	4	4	2	2	11	240	Apr 29 Friday
120	3	4	3	17	5	7	9	13	7	10	10	33	18	7	19	6	14	8	10	10	13	15	19	20	280	Apr 30 Saturday
121	24	15	20	16	28	15	13	18	10	26	18	14	29	10	12	16	10	7	12	9	15	15	5	9	366	May 01 Sunday
122	14	10	12	17	7	4	0	1	0	7	6	2	10	8	1	1	3	15	5	2	10	9	12	7	163	May 02 Monday
123	7	7	6	8	12	4	3	10	5	11	5	8	11	14	9	6	7	8	1	4	3	10	12	9	180	May 03 Tuesday
124	5	4	7	6	5	7	16	2	6	15	15	6	9	4	3	9	3	5	6	4	2	2	8	6	155	May 04 Wednesday
125	4	11	4	6	3	15	18	3	2	8	13	18	8	7	7	7	2	0	3	11	3	4	3	4	164	May 05 Thursday
126	7	8	9	12	11	1	2	3	8	13	3	8	3	7	8	8	4	1	10	6	3	15	13	6	169	May 06 Friday
127	3	16	6	5	6	6	12	3	5	10	0	6	2	22	7	19	1	3	10	2	4	5	12	16	181	May 07 Saturday
128	2	6	10	3	7	17	2	1	3	7	6	7	2	5	1	2	0	1	5	3	2	1	8	0	101	May 08 Sunday
129	0	0	0	0	0	0	2	10	2	13	7	3	15	3	5	17	5	2	8	1	2	4	1	0	100	May 09 Monday
130	5	0	14	2	6	4	22	18	12	6	3	7	10	13	0	0	4	5	10	13	2	6	0	5	167	May 10 Tuesday
131	8	10	1	0	0	6	7	3	18	5	4	2	7	6	6	0	4	6	1	2	9	26	0	2	133	May 11 Wednesday
132	6	3	2	3	3	8	2	1	3	6	3	4	0	0	1	12	6	1	0	12	3	0	0	6	85	May 12 Thursday
133	2	0	2	1	2	1	0	0	1	6	6	5	6	14	0	0	0	0	0	0	5	0	1	0	52	May 13 Friday
134	0	6	0	2	4	1	1	11	13	3	2	2	1	2	0	8	0	2	0	0	1	3	11	5	78	May 14 Saturday
135	7	2	8	3	1	17	5	3	6	4	7	4	1	4	3	7	8	2	4	11	5	6	6	10	134	May 15 Sunday
136	16	10	16	10	3	5	3	3	7	5	3	6	6	2	7	8	6	10	7	11	6	8	11	6	175	May 16 Monday
137	9	7	12	10	5	11	6	11	3	31	18	14	18	12	28	8	3	8	15	4	15	5	9	6	268	May 17 Tuesday
138	14	7	16	9	18	2	7	9	2	17	15	16	24	18	16	12	23	12	3	23	14	8	7	7	299	May 18 Wednesday
139	4	6	4	6	11	2	3	11	2	3	20	10	7	7	3	1	6	2	8	7	7	10	7	5	152	May 19 Thursday
140	9	2	3	5	1	1	2	9	2	15	8	14	8	5	2	1	17	3	9	5	7	7	3	7	145	May 20 Friday
141	6	6	7	8	6	7	5	6	4	2	1	4	6	7	9	2	13	3	6	5	5	2	12	13	145	May 21 Saturday
142	10	7	5	6	3	10	8	9	9	9	5	9	6	2	2	4	6	9	2	5	7	4	5	11	153	May 22 Sunday
143	7	13	9	5	3	14	21	15	5	4	10	4	2	10	2	6	2	6	3	5	3	6	10	9	174	May 23 Monday
144	7	10	24	19	32	2	18	8	2	8	9	19	2	14	6	3	8	7	8	5	6	18	11	12	258	May 24 Tuesday
145	8	19	11	8	21	4	0	19	8	1	4	11	8	10	15	5	6	7	10	13	7	19	19	18	251	May 25 Wednesday
146	22	12	7	26	11	4	5	12	19	5	14	4	10	7	18	7	5	9	6	8	8	10	6	12	247	May 26 Thursday

Table 2.3.2 (Page 1 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	6	13	13	12	15	3	1	5	13	6	2	12	10	4	12	8	6	1	16	5	3	22	14	12	214	May 27 Friday
148	14	10	12	8	10	4	6	6	9	19	30	9	10	6	6	9	8	5	19	11	12	11	23	13	270	May 28 Saturday
149	18	10	17	11	16	10	15	10	11	9	7	17	12	12	21	25	12	9	1	8	11	14	11	10	297	May 29 Sunday
150	8	15	11	15	10	4	1	0	10	5	16	6	8	17	5	7	6	12	12	16	11	16	14	26	251	May 30 Monday
151	16	21	10	23	23	13	15	9	5	11	15	16	23	7	13	16	18	19	20	13	19	15	17	19	376	May 31 Tuesday
152	22	14	16	15	18	7	1	9	3	14	3	13	9	13	20	17	14	21	15	4	7	8	10	14	287	Jun 01 Wednesday
153	7	4	3	8	6	1	6	3	2	8	0	17	6	22	5	26	19	18	34	0	1	8	3	4	211	Jun 02 Thursday
154	7	6	8	6	1	6	1	5	0	13	5	9	15	8	11	4	14	7	7	10	10	47	23	15	238	Jun 03 Friday
155	11	38	14	7	10	6	8	13	8	10	5	6	5	2	27	19	3	5	8	10	16	5	4	8	248	Jun 04 Saturday
156	4	22	17	4	6	8	8	4	7	2	4	1	3	3	11	6	14	8	16	12	5	9	2	10	186	Jun 05 Sunday
157	7	6	11	24	6	2	3	24	13	15	11	12	13	12	18	2	5	14	17	16	15	19	8	7	280	Jun 06 Monday
158	11	12	12	23	16	14	6	4	1	5	6	12	18	33	12	6	4	4	11	11	7	3	3	8	242	Jun 07 Tuesday
159	7	5	5	6	8	2	1	8	4	3	3	4	9	10	14	14	3	10	5	2	14	11	11	14	173	Jun 08 Wednesday
160	20	34	30	15	25	12	11	18	11	9	9	13	13	4	7	0	10	4	4	4	10	9	5	6	283	Jun 09 Thursday
161	10	10	9	30	3	3	7	4	3	11	6	13	10	12	13	19	13	34	5	14	15	21	26	22	313	Jun 10 Friday
162	24	15	12	11	18	6	11	18	28	23	23	20	10	17	18	11	41	27	18	13	20	23	20	19	446	Jun 11 Saturday
163	12	16	26	16	13	13	20	18	17	10	23	10	21	12	18	3	15	13	6	15	4	8	7	5	321	Jun 12 Sunday
164	28	10	16	17	5	5	3	4	2	7	3	1	9	6	13	6	13	22	7	5	17	26	18	18	261	Jun 13 Monday
165	14	13	11	19	13	11	5	3	7	4	2	17	14	6	7	12	10	13	13	21	20	20	18	20	293	Jun 14 Tuesday
166	20	8	24	11	15	11	7	6	4	17	9	6	15	7	14	9	12	15	16	10	19	17	32	21	325	Jun 15 Wednesday
167	13	16	20	13	8	6	3	5	7	20	30	4	14	18	11	6	3	9	9	11	36	16	19	11	308	Jun 16 Thursday
168	19	15	8	19	16	8	13	1	9	29	15	21	12	15	16	6	6	5	9	1	6	6	15	7	277	Jun 17 Friday
169	10	10	19	27	25	20	14	16	16	12	9	8	12	11	10	16	13	10	6	7	13	16	15	22	337	Jun 18 Saturday
170	10	12	20	7	18	26	12	11	16	14	12	15	15	15	21	14	18	17	15	12	21	18	21	18	378	Jun 19 Sunday
171	14	19	18	8	6	4	1	3	6	28	19	4	7	4	3	4	6	5	5	3	11	9	11	18	216	Jun 20 Monday
172	40	20	24	12	12	1	1	5	9	12	10	2	5	8	3	12	7	4	3	1	3	4	6	11	215	Jun 21 Tuesday
173	14	14	9	6	7	8	5	10	11	8	0	11	8	9	8	9	5	5	9	9	21	15	7	9	217	Jun 22 Wednesday
174	13	13	18	14	14	10	8	10	5	5	6	7	8	17	11	10	12	13	13	11	15	11	14	16	274	Jun 23 Thursday
175	14	19	13	12	11	7	6	5	2	4	2	6	3	7	6	3	10	7	5	12	3	6	9	11	183	Jun 24 Friday
176	9	11	9	15	14	17	12	16	26	19	11	14	14	10	14	15	16	22	16	12	5	16	27	10	350	Jun 25 Saturday
177	12	17	7	10	8	9	8	13	2	6	10	14	9	8	7	14	7	9	11	8	13	7	8	8	225	Jun 26 Sunday
178	7	11	6	12	5	3	0	4	2	1	6	6	5	1	10	1	6	8	11	9	16	3	8	9	150	Jun 27 Monday
179	11	5	11	12	4	7	2	0	1	2	9	16	11	11	15	5	4	4	13	8	2	8	2	10	173	Jun 28 Tuesday
180	14	9	20	4	11	0	10	4	4	6	0	10	7	10	8	4	6	1	6	4	9	4	5	7	163	Jun 29 Wednesday
181	17	3	6	3	9	4	16	5	7	14	14	12	6	12	16	3	7	3	6	3	9	8	7	8	198	Jun 30 Thursday
182	12	5	8	9	6	13	4	1	0	4	32	6	3	15	7	4	2	1	6	13	19	1	20	6	197	Jul 01 Friday
183	4	4	3	7	5	10	10	7	2	22	2	29	14	5	3	3	5	5	1	1	26	12	13	2	195	Jul 02 Saturday
184	0	4	2	13	2	0	2	5	5	2	2	3	5	2	4	2	4	1	0	9	5	10	6	5	93	Jul 03 Sunday
185	10	15	7	6	7	7	4	2	1	2	9	3	5	3	3	9	9	5	3	8	9	10	8	8	153	Jul 04 Monday
186	8	4	5	13	6	1	2	10	4	7	15	13	10	15	6	4	7	4	6	0	5	11	5	2	163	Jul 05 Tuesday
187	7	4	8	2	2	7	2	3	7	26	1	19	32	17	3	14	3	1	7	2	5	10	4	2	188	Jul 06 Wednesday
188	12	13	9	9	2	3	3	5	5	4	11	20	12	17	0	11	3	14	7	10	9	6	15	12	212	Jul 07 Thursday
189	12	8	8	12	0	3	5	4	7	11	22	17	14	5	6	15	6	14	11	4	10	19	4	11	228	Jul 08 Friday
190	3	2	7	2	6	2	9	0	2	1	2	5	13	31	25	13	38	9	4	10	12	12	7	16	231	Jul 09 Saturday
191	12	17	15	21	13	10	6	10	4	8	4	0	6	9	7	5	7	5	2	4	5	6	10	13	199	Jul 10 Sunday
192	4	7	7	7	12	3	15	0	0	3	1	14	12	6	0	1	4	4	0	11	7	17	14	9	158	Jul 11 Monday
193	16	5	5	8	8	4	7	4	7	3	10	8	15	17	4	3	4	9	11	3	4	10	7	7	179	Jul 12 Tuesday
194	6	6	18	35	2	10	1	3	5	10	8	4	27	3	5	2	5	6	4	1	3	3	6	3	176	Jul 13 Wednesday
195	17	5	8	3	14	12	15	2	13	13	4	13	10	15	5	16	2	0	11	9	16	13	2	7	225	Jul 14 Thursday
196	3	2	6	0	1	0	0	13	4	7	19	59	60	10	1	6	4	52	15	10	3	6	7	11	299	Jul 15 Friday
197	14	1	6	6	8	1	15	2	2	1	0	5	1	0	2	2	4	8	21	4	8	8	0	5	124	Jul 16 Saturday
198	7	11	7	4	2	9	4	4	5	1	8	1	4	4	4	4	7	7	3	9	4	7	18	8	142	Jul 17 Sunday
199	24	6	12	9	8	12	4	4	2	7	7	18	3	5	15	11	21	5	28	3	17	10	11	15	257	Jul 18 Monday
200	7	7	4	6	22	8	5	2	9	5	5	10	14	3	6	1	14	3	1	3	0	0	0	0	135	Jul 19 Tuesday
201	0	0	0	0	0	0	3	8	7	7	3	5	9	5	12	5	11	2	17	0	10	4	8	10	126	Jul 20 Wednesday
202	2	10	14	15	6	4	6	3	1	3	11	7	11	25	17	13	31	9	17	21	14	15	1	7	263	Jul 21 Thursday

Table 2.3.2. (Page 2 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	9	11	11	8	7	3	4	4	8	2	19	12	5	8	1	11	7	23	16	7	7	14	18	21	236	Jul 22 Friday
204	12	22	14	22	18	32	24	28	12	13	15	13	12	8	12	12	11	12	15	11	17	11	7	16	369	Jul 23 Saturday
205	12	17	25	23	16	22	21	18	8	11	9	14	4	10	24	12	6	4	12	10	10	10	35	19	352	Jul 24 Sunday
206	18	34	54	20	13	9	11	4	1	2	6	11	2	5	11	5	13	15	0	2	7	3	25	9	280	Jul 25 Monday
207	9	11	5	6	13	4	2	1	4	3	10	6	1	13	6	12	12	14	17	6	11	8	5	7	186	Jul 26 Tuesday
208	2	8	8	5	11	13	10	7	10	12	15	14	18	7	1	12	2	20	14	16	7	13	3	7	235	Jul 27 Wednesday
209	2	5	4	2	8	9	7	8	11	14	20	13	5	5	4	0	8	7	4	14	5	3	3	7	168	Jul 28 Thursday
210	19	12	12	12	9	15	1	4	8	9	0	33	13	10	9	8	9	6	13	7	8	10	11	6	244	Jul 29 Friday
211	7	7	9	5	6	14	20	1	5	1	11	12	6	13	10	0	4	10	4	1	4	14	11	5	180	Jul 30 Saturday
212	5	4	4	1	8	25	13	6	0	2	1	6	4	1	11	10	6	10	5	5	8	12	12	5	164	Jul 31 Sunday
213	10	13	12	6	8	1	2	10	2	3	4	6	8	8	7	4	18	4	4	10	2	7	4	13	166	Aug 01 Monday
214	9	3	8	11	5	2	4	0	3	2	7	3	10	9	15	5	9	3	8	0	8	4	3	5	136	Aug 02 Tuesday
215	1	8	18	3	3	10	0	11	7	15	1	11	6	6	0	17	6	7	17	9	3	6	7	3	175	Aug 03 Wednesday
216	10	2	16	5	3	3	10	2	1	20	5	0	8	7	15	14	7	6	10	7	5	14	30	5	205	Aug 04 Thursday
217	11	11	11	17	15	13	15	4	9	10	5	12	10	26	14	2	2	3	23	4	10	3	2	8	240	Aug 05 Friday
218	5	13	13	5	5	11	8	6	3	7	4	11	19	14	13	26	12	15	15	16	10	17	11	10	269	Aug 06 Saturday
219	6	9	9	15	17	14	18	10	11	9	6	2	10	13	6	15	11	6	2	4	2	9	13	13	230	Aug 07 Sunday
220	9	10	10	7	7	8	2	4	4	1	3	12	10	5	10	3	4	7	3	6	16	18	7	6	172	Aug 08 Monday
221	17	13	8	12	3	1	16	15	3	10	6	2	12	7	8	6	8	18	9	8	4	12	10	22	230	Aug 09 Tuesday
222	4	16	20	9	4	0	1	1	4	17	2	12	17	14	9	19	9	6	8	18	14	6	9	15	234	Aug 10 Wednesday
223	9	15	9	17	8	1	8	1	7	6	11	11	15	5	7	1	6	1	2	23	8	18	15	11	215	Aug 11 Thursday
224	11	9	11	5	5	7	0	4	4	9	13	18	8	0	12	7	12	3	7	4	6	19	12	10	196	Aug 12 Friday
225	21	17	19	13	24	17	18	8	10	14	28	26	10	13	18	28	17	16	17	15	23	13	16	23	424	Aug 13 Saturday
226	24	23	21	22	11	8	16	16	7	15	11	15	18	12	12	15	16	14	12	17	19	21	17	14	376	Aug 14 Sunday
227	19	23	18	17	15	13	16	7	13	2	10	5	4	2	11	10	4	2	9	5	7	8	6	8	234	Aug 15 Monday
228	11	4	11	13	17	3	2	10	2	13	19	14	23	7	15	4	13	2	2	1	1	7	8	11	213	Aug 16 Tuesday
229	18	9	9	9	7	5	5	5	1	2	1	14	14	16	1	8	11	6	17	6	14	12	8	8	206	Aug 17 Wednesday
230	19	14	5	10	25	31	7	4	0	4	12	9	17	15	20	13	4	2	17	6	3	9	17	24	287	Aug 18 Thursday
231	14	11	23	24	11	10	10	7	9	14	24	11	7	8	14	14	6	13	8	19	9	19	13	18	316	Aug 19 Friday
232	16	11	19	15	17	9	12	6	13	16	13	13	19	13	11	14	11	11	21	16	19	24	12	11	342	Aug 20 Saturday
233	12	8	17	12	19	18	15	9	12	4	6	6	2	3	3	5	10	7	7	4	2	5	5	14	205	Aug 21 Sunday
234	3	9	3	2	4	2	6	3	3	7	16	20	42	9	3	3	7	12	7	7	13	19	6	8	214	Aug 22 Monday
235	4	7	4	3	3	6	8	2	7	5	14	12	20	7	28	6	0	4	5	0	14	16	6	10	191	Aug 23 Tuesday
236	19	21	15	8	7	1	4	4	7	4	14	4	11	9	14	11	6	7	12	10	14	18	18	6	244	Aug 24 Wednesday
237	7	14	12	13	7	5	3	7	2	14	28	7	8	9	10	6	15	8	3	9	2	13	13	17	232	Aug 25 Thursday
238	11	8	12	13	5	11	7	4	5	8	13	18	2	3	8	6	12	10	13	8	8	12	14	10	221	Aug 26 Friday
239	8	11	13	14	11	10	15	15	10	25	8	12	12	10	8	15	13	9	16	9	13	12	4	15	288	Aug 27 Saturday
240	12	18	17	11	9	9	8	23	14	11	16	4	11	13	9	27	11	10	14	16	21	21	14	10	329	Aug 28 Sunday
241	24	27	19	19	12	8	8	8	17	10	9	14	6	12	19	13	8	19	5	11	7	20	20	18	333	Aug 29 Monday
242	11	11	18	16	6	6	9	10	5	4	13	14	15	3	19	23	17	8	1	19	16	22	13	11	290	Aug 30 Tuesday
243	9	7	4	11	20	4	2	1	7	15	16	8	7	15	13	13	19	6	17	4	7	8	13	18	244	Aug 31 Wednesday
244	15	17	16	10	5	6	1	9	8	10	7	25	27	10	3	23	24	17	7	15	21	14	8	23	321	Sep 01 Thursday
245	17	16	17	11	9	6	4	6	3	6	4	6	3	4	10	6	4	4	11	11	8	22	14	18	220	Sep 02 Friday
246	13	9	9	13	14	10	11	11	4	3	8	5	8	3	6	9	8	4	11	8	9	9	11	20	216	Sep 03 Saturday
247	11	13	17	10	9	14	9	13	9	13	12	4	13	11	5	12	11	1	11	14	14	6	7	8	247	Sep 04 Sunday
248	8	13	24	16	4	15	1	1	2	7	3	12	16	16	7	13	2	17	11	37	11	16	16	12	280	Sep 05 Monday
249	16	10	11	8	5	7	4	5	7	15	9	16	8	10	13	13	11	5	3	11	8	6	10	17	228	Sep 06 Tuesday
250	15	9	13	7	27	6	2	3	2	10	3	7	7	14	18	17	14	10	10	23	11	14	8	20	270	Sep 07 Wednesday
251	14	17	17	12	2	7	15	6	12	33	12	20	11	6	15	17	9	4	8	11	15	7	16	15	301	Sep 08 Thursday
252	14	22	20	14	9	16	6	11	11	12	11	11	9	10	9	7	6	14	16	9	6	2	8	5	258	Sep 09 Friday
253	9	8	11	7	5	11	6	4	4	6	6	14	12	8	8	10	7	11	14	16	18	10	15	13	233	Sep 10 Saturday
254	13	31	12	21	20	16	13	12	12	11	12	10	19	8	21	20	15	18	19	12	12	10	13	13	363	Sep 11 Sunday
255	7	7	9	10	8	3	4	3	0	8	8	20	15	2	5	6	9	11	7	3	7	7	14	14	187	Sep 12 Monday
256	16	14	20	20	13	2	4	6	3	7	20	12	20	15	13	7	13	9	11	15	13	10	17	16	296	Sep 13 Tuesday
257	16	16	30	18	7	3	8	3	20	15	0	17	16	5	6	1	13	2	13	7	10	10	11	12	259	Sep 14 Wednesday
258	19	21	13	10	14	1	10	15	9	10	13	11	5	6	8	11	11	10	12	23	10	12	25	15	294	Sep 15 Thursday

Table 2.3.2. (Page 3 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	20	13	23	15	9	10	18	12	5	13	11	6	14	8	13	10	12	11	10	14	9	11	12	15	294	Sep 16 Friday
260	12	18	25	22	14	20	15	20	12	17	14	12	8	17	13	13	23	13	17	16	8	15	27	15	386	Sep 17 Saturday
261	21	18	20	19	13	11	17	15	8	7	23	10	9	3	4	4	6	20	6	5	10	8	9	8	274	Sep 18 Sunday
262	7	8	6	10	3	4	4	9	2	3	2	15	5	4	16	18	1	5	12	19	14	25	16	16	224	Sep 19 Monday
263	25	13	14	14	14	9	8	7	12	7	2	20	2	7	16	7	7	4	4	15	17	11	12	10	257	Sep 20 Tuesday
264	6	10	17	11	7	3	5	2	11	6	15	13	9	6	18	9	4	9	12	15	13	14	22	21	258	Sep 21 Wednesday
265	16	30	23	21	18	23	11	15	6	8	5	18	11	14	13	8	16	13	20	25	20	18	12	24	388	Sep 22 Thursday
266	24	16	24	28	14	6	5	0	3	3	5	24	11	10	10	5	3	15	12	15	12	12	16	23	296	Sep 23 Friday
267	23	28	14	25	14	11	16	21	13	10	13	17	15	14	11	11	21	19	15	30	16	15	10	16	398	Sep 24 Saturday
268	19	18	14	17	17	16	14	18	13	13	9	13	13	6	9	12	9	11	12	14	11	15	14	13	320	Sep 25 Sunday
269	10	10	15	14	12	10	9	2	2	2	8	10	7	21	9	7	11	12	16	14	10	11	17	16	255	Sep 26 Monday
270	15	15	28	17	29	20	20	13	6	9	21	13	19	9	11	13	7	10	16	8	12	19	13	22	365	Sep 27 Tuesday
271	17	10	9	17	20	23	11	8	11	14	15	10	23	8	5	14	38	23	14	9	10	24	17	26	376	Sep 28 Wednesday
272	25	22	18	21	18	14	11	11	9	10	6	9	7	8	16	9	10	9	13	10	11	11	10	16	304	Sep 29 Thursday
273	12	10	17	21	19	10	8	11	4	5	11	8	18	10	8	8	18	14	28	31	21	15	21	21	349	Sep 30 Friday
NB2	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	2271	2281	2361	2275	1982	1577	1507	1518	1386	1748	1751	2078	2053	1867	1942	1749	1807	1783	1892	1819	1879	2156	2137	2252	46071	Total sum
183	12	12	13	12	11	9	8	8	8	10	10	11	11	10	11	10	10	10	10	10	10	12	12	12	252	Total average
126	13	12	13	12	10	7	6	7	6	9	9	11	11	10	10	8	9	9	10	9	9	12	11	12	235	Average workdays
57	12	14	13	13	13	13	12	12	10	11	11	11	10	10	12	12	12	10	11	11	12	12	13	13	283	Average weekends

Table 2.3.2. Daily and hourly distribution of NORSAR detections. For each day is shown number of detections within each hour of the day and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day. (Page 4 of 4)

3 Operation of Regional Arrays

3.1 Recording of NORESS data at NDPC, Kjeller

Table 3.1.1 lists the main outage times and reasons.

The average recording time was 94.37% as compared to 96.48% during the previous reporting period.

Date	Time			Cause
06 May	1518	-		Hardware failure
07 May		-	0843	
12 May	2007	-		Hardware failure
13 May		-	0629	
16 May	1459	-		Hardware failure
18 May		-	0602	
18 May	1125	-	1143	Hardware failure
22 May	0726	-	0956	Hardware failure
31 May	0237	-	0622	Hardware failure
31 May	0849	-	0904	Hardware failure
13 Jun	1316	-	1329	Hardware failure
27 Jun	1329	-		Continuous gaps of length from 1 sec to several minutes
29 Jun		-	1300	
08 Jul	0746	-	0902	Power failure due to thunderstorm
18 Jul	0501	-	0604	Hardware failure
26 Jul	1858	-	2047	Hardware failure
27 Jul	1342	-	1619	Power failure due to thunderstorm
27 Jul	2100	-		Power failure due to thunderstorm
29 Jul		-	0145	
10 Aug	0914	-	1047	Hardware maintenance
10 Aug	1109	-	1122	Hardware maintenance
02 Sep	1550	-		Hardware failure
05 Sep		-	0617	
22 Sep	0349	-	0620	Hardware failure
25 Sep	0100	-	0200	Software failure

Table 3.1.1. Interruptions in recording of NORESS data at NDPC, 1 April - 30 September 1994.

Monthly uptimes for the NORESS on-line data recording task, taking into account all factors (field installations, transmissions line, data center operation) affecting this task were as follows:

April 94	:	99.21
May	:	88.12
June	:	95.79
July	:	95.42
August	:	98.25
September	:	89.42

Fig. 3.1.1 shows the uptime for the data recording task, or equivalently, the availability of NORESS data in our tape archive, on a day-by-day basis, for the reporting period.

J. Torstveit

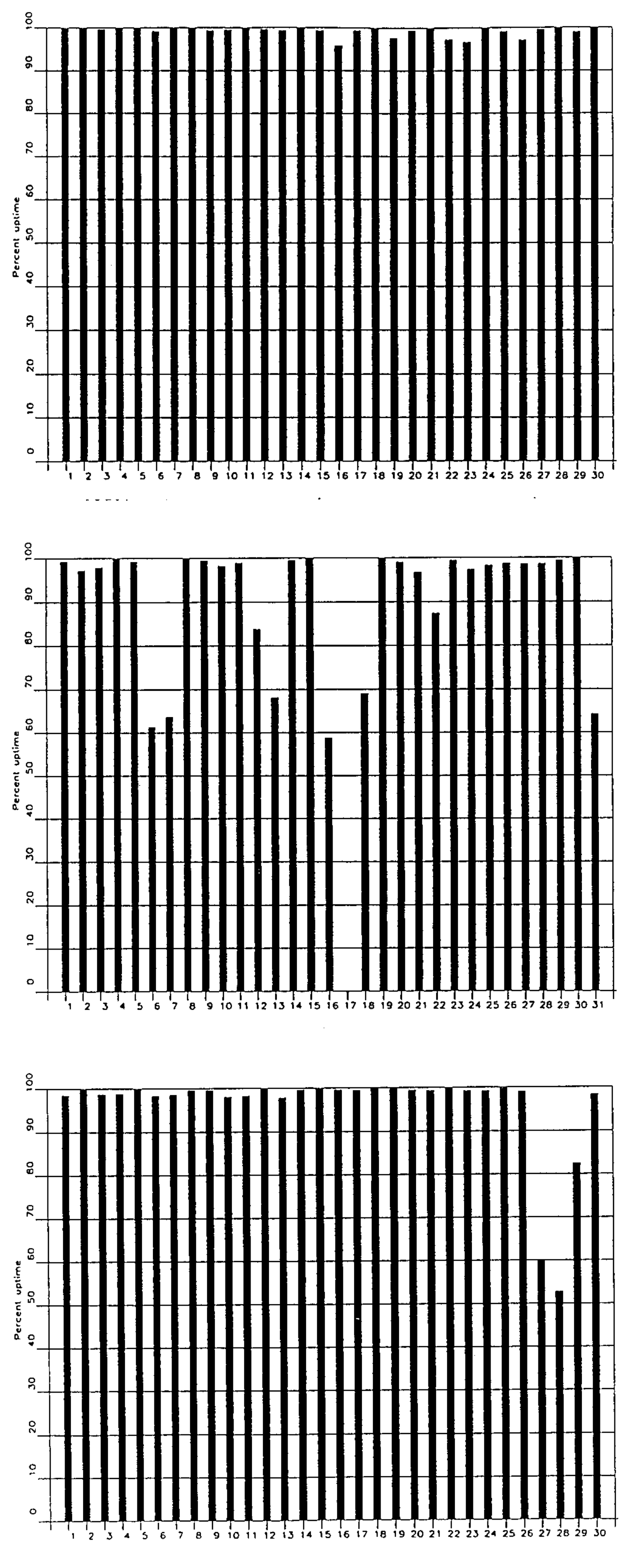

Fig. 3.1.1. NORESS data recording uptime for April (top), May (middle) and June (bottom) 1994.

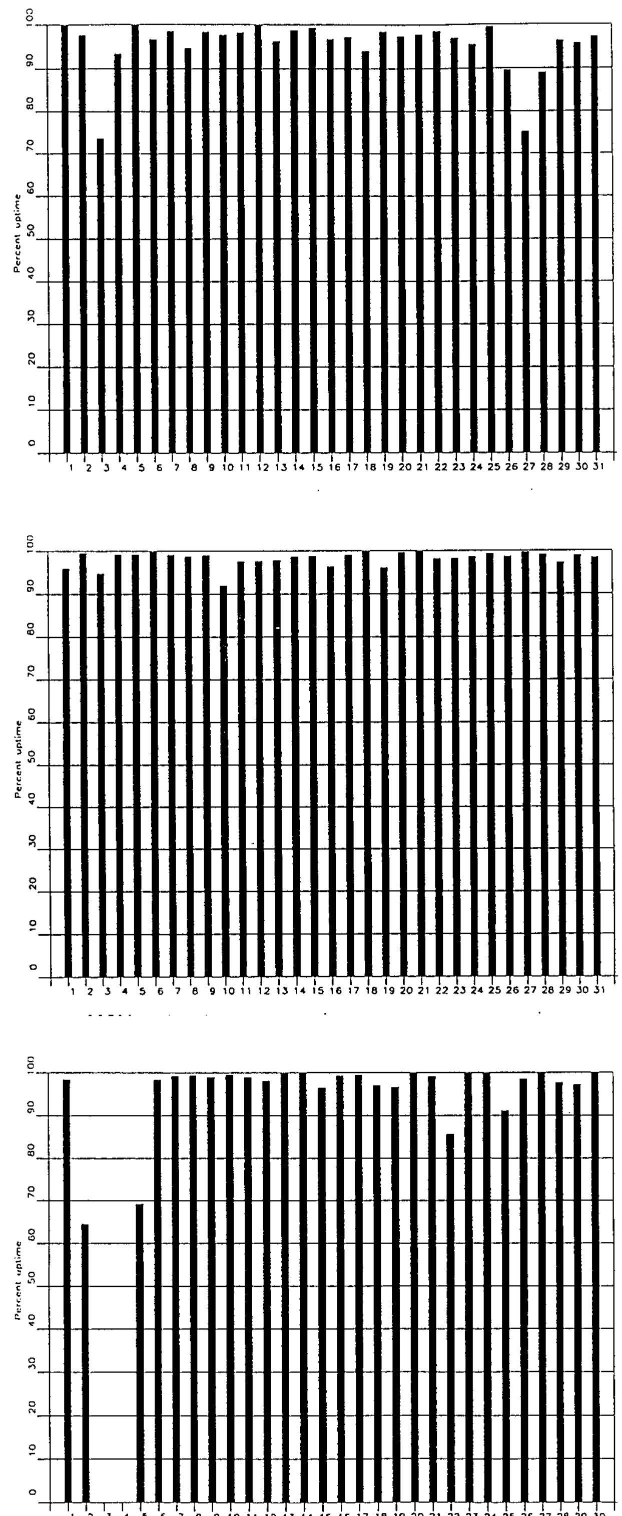

Fig. 3.1.1. (cont.) NORESS data recording uptime for July (top), August (middle) and September (bottom) 1994.

3.2 Recording of ARCESS data at NDPC, Kjeller

Table 3.2.1 lists the main outage times and reasons.

The average recording time was 99.28% as compared to 99.19% for the previous reporting period.

Date	Time			Cause
16 Jun	2239	-		Satellite link failure
17 Jun		-	0406	
07 Jul	0743	-	1446	Work on power line to Hub
10 Jul	0537	-	2202	Transmission line failure
13 Aug	1341	-	1450	Hardware failure
13 Aug	1504	-	1541	Hardware failure
23 Aug	0634	-	0919	Power failure Hub
28 Aug	1556	-		Hardware failure
29 Aug		-	0700	

Table 3.2.1. The main interruptions in recording of ARCESS data at NDPC, 1 April - 30 September 1994.

Monthly uptimes for the ARCESS on-line data recording task, taking into account all factors (field installations, transmissions line, data center operation) affecting this task were as follows:

April 94	:	100.00%
May	:	99.94%
June	:	99.23%
July	:	96.49%
August	:	98.72%
September	:	97.89%

Fig. 3.2.1. shows the uptime for the data recording task, or equivalently, the availability of ARCESS data in our tape archive, on a day-by-day basis, for the reporting period.

J. Torstveit

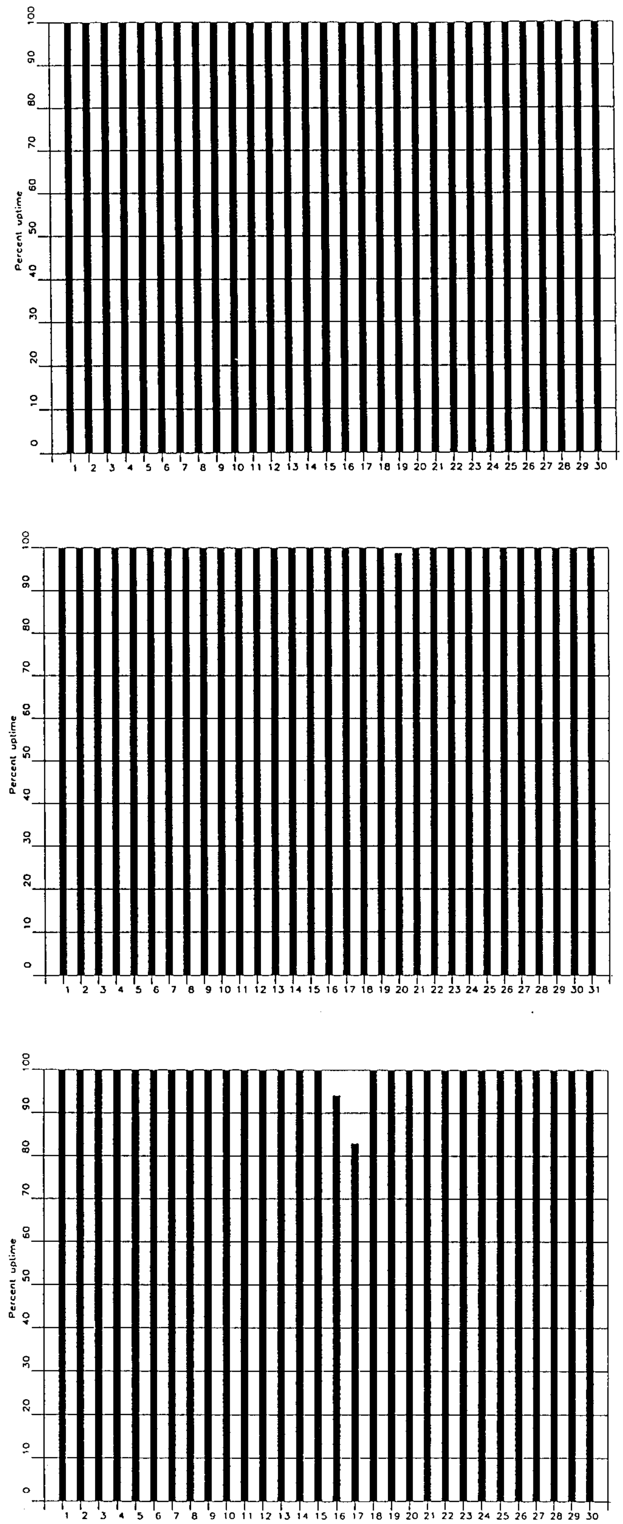

Fig. 3.2.1. ARCESS data recording uptime for April (top), May (middle) and June (bottom) 1994.

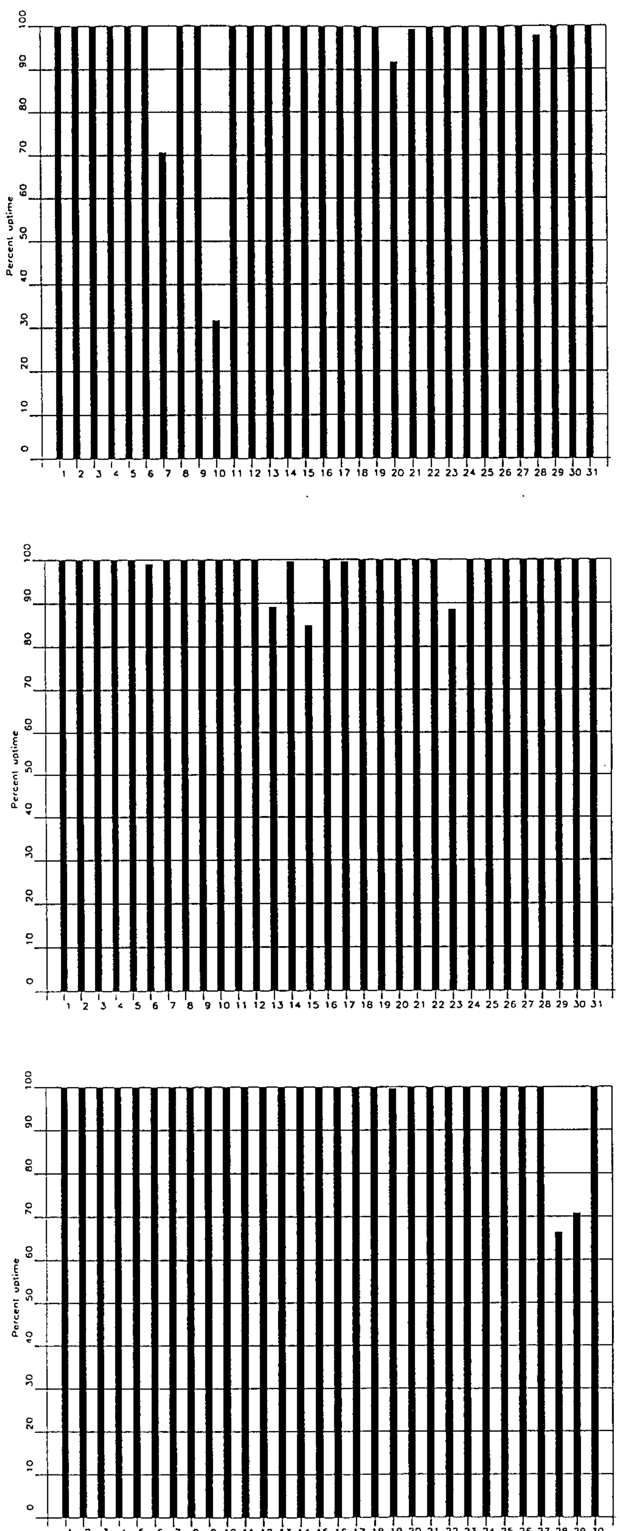

Fig. 3.2.1. ARCESS data recording uptime for July (top), August (middle) and September (bottom) 1994.

3.3 Recording of FINESS data at NDPC, Kjeller

The average recording time was 95.7%.

Date	Time	Cause
11 May	1916 - 2312	Transmission line failure
12 May	1450 - 2214	Transmission line failure
08 Jun	1306 -	Transmission line failure
09 Jun	- 0638	
21 Jul	0416 - 1022	Transmission line failure
12 Aug	1940 -	Transmission line failure
15 Aug	- 0632	
27 Aug	0459 -	Transmission line failure
29 Aug	- 0551	
30 Aug	1014 - 2017	Transmission line failure
09 Sep	0513 - 1012	Hub failure
16 Sep	1553 -	Problems in Finland
17 Sep	- 1300	

Table 3.3.1. The main interruptions in recording of FINESS data at NDPC, 1 April - 30 September 1994.

Monthly uptimes for the FINESS on-line data recording task, taking into account all factors (field installations, transmission lines, data center operation) affecting this task were as follows:

April 94	:	99.95%
May	:	98.44%
June	:	97.55%
July	:	99.17%
August	:	84.31%
September	:	96.40%

Fig. 3.3.1 shows the uptime for the data recording task, or equivalently, the availability of FINESS data in our tape archive, on a day-by-day basis, for the reporting period.

J. Torstveit

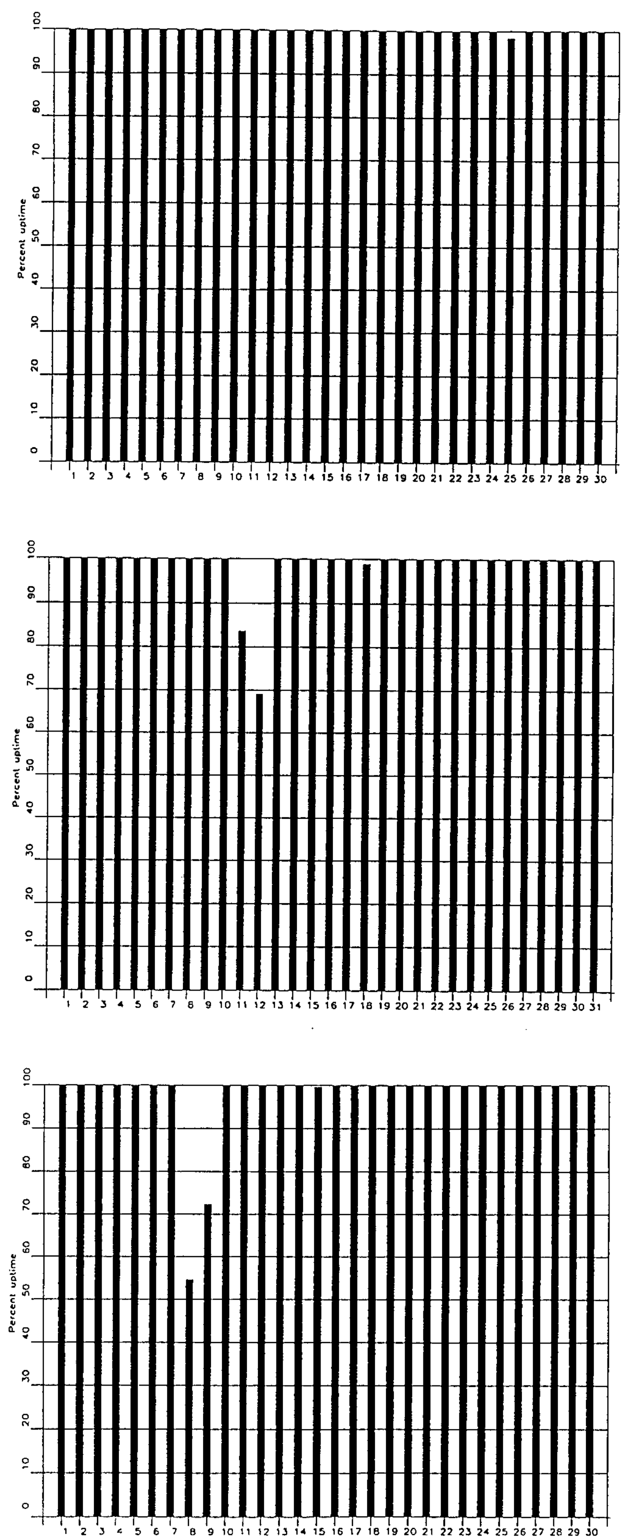

Fig. 3.3.1. FINESS data recording uptime for April (top), May (middle) and June (bottom) 1994.

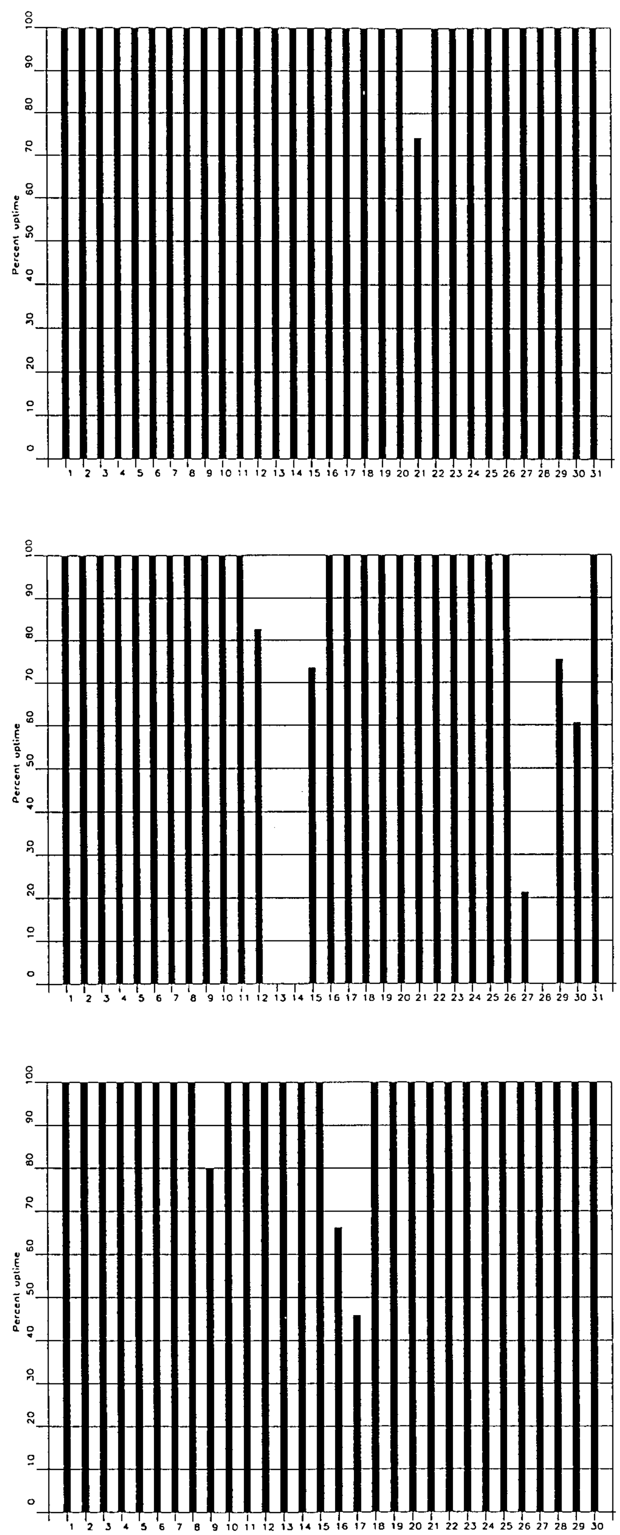

Fig. 3.3.1. FINESS data recording uptime for July (top), August (middle) and September (bottom) 1994.

3.4 Recording of Spitsbergen data at NDPC, Kjeller

The average recording time was 91.8% as compared to 88.39% for the previous reporting period.

The main reasons for downtime follow:

Date	Time			Cause
08 Apr	2216	-	2300	Communication line failure
09 Apr	0034	-	0134	Communication line failure
22 Apr	2217	-	2245	Communication line failure
29 Apr	0400	-	0432	Communication line failure
05 May	0849	-	1250	Radio link problems
07 Jun	0619	-		Communication line failure
10 Jun		-	0738	
04 Jul	1612	-		Communication line failure
05 Jul		-	0804	
08 Jul	1016	-	1322	Maintenance communication line
12 Jul	0913	-	1051	Communication line failure
20 Jul	1749	-		Communication line failure
21 Jul		-	1128	
02 Aug	1450	-		Communication line failure
03 Aug		-	0735	
13 Aug	1019	-		Maintenance communication line
15 Aug		-	0908	
22 Aug	1406	-		Maintenance and site construction work
26 Aug		-	1741	
26 Aug	2219	-		Maintenance and site construction work
28 Aug		-	2050	
29 Aug	0955	-	1833	Maintenance and site construction work
31 Aug	1625	-	2214	Maintenance and site construction work
01 Sep	0639	-	1001	Maintenance and site construction work
15 Sep	0056	-	0408	Communication line failure

Monthly uptimes for the Spitsbergen online data recording task, taking into account all factors (field installations, transmission line, data center operation) affecting this task were as follows:

April 94	:	99.51%
May	:	98.45%
June	:	89.81%
July	:	94.42%
August	:	69.48%
September	:	99.12%

Fig. 3.4.1 shows the uptime for the data recording task, or equivalently, the availability of Spitsbergen data in our tape archive, on a day-by-day basis for the reporting period.

J. Torstveit

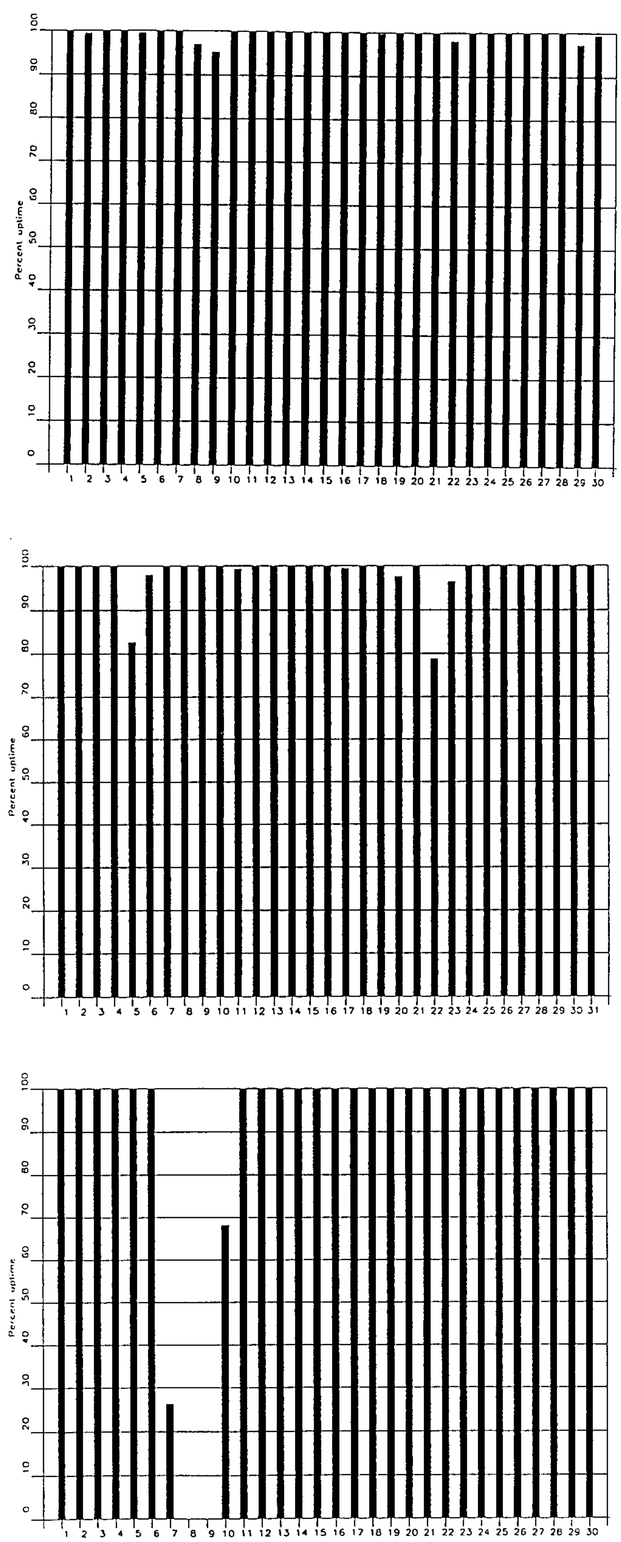

Fig. 3.4.1. Spitsbergen data recording uptime for April (top), May (middle) and June (bottom) 1994.

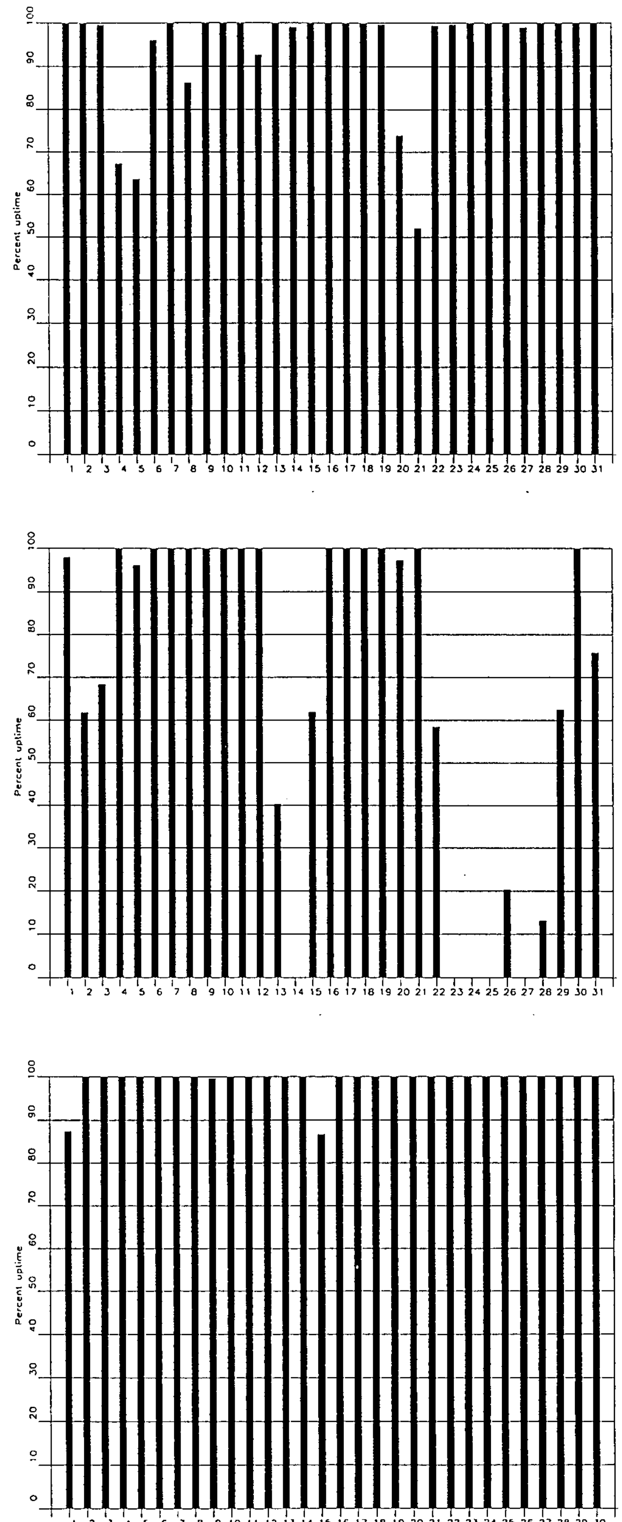

Fig. 3.4.1. Spitsbergen data recording uptime for July (top), August (middle) and September (bottom) 1994.

3.5 Event detection operation

This section reports results from one-array automatic processing using signal processing recipes and "ronapp" recipes for the ep program (NORSAR Sci. Rep. No 2-88/89).

Three systems are in parallel operation to associate detected phases and locate events:

1. The ep program with "ronapp" recipes is operated independently on each array to obtain simple one-array automatic solutions.
2. The Generalized Beamforming method (GBF) (see F. Ringdal and T. Kværna (1989), A mulitchannel processing approach to real time network detection, phase association and threshold monitoring, BSSA Vol 79, no 6, 1927-1940) processes the four arrays jointly and presents locations of regional events.
3. The IMS system is operated on the same set of arrivals as ep and GBF and reports also teleseismic events in addition to regional ones.

IMS results are reported in section 3.6.

In addition to these three event association processes, we are running test versions of the so-called Threshold Monitoring (TM) process. This is a process that monitors the seismic amplitude level at the four regional arrays continuously in time to estimate the upper magnitude limit of an event that might go undetected by the network. The current TM process is beamed to several sites of interest, including the Novaya Zemlya test site. Simple displays of so-called threshold curves reveal instants of particular interest; i.e., instants when events above a certain magnitude threshold may have occurred in the target region. Results from the three processes described above are used to help resolve what actually happened during these instances.

NORESS detections

The number of detections (phases) reported from day 091, 1994, through day 273, 1994, was 36,245, giving an average of 202 detections per processed day (179 days processed).

Table 3.5.1 shows daily and hourly distribution of detections for NORESS.

Events automatically located by NORESS

During days 091, 1994, through 273, 1994, 2267 local and regional events were located by NORESS, based on automatic association of P- and S-type arrivals. This gives an average of 12.7 events per processed day (179 days processed). 71% of these events are within 300 km, and 89% of these events are within 1000 km.

ARCESS detections

The number of detections (phases) reported during day 091, 1994, through day 273, 1994, was 70,784, giving an average of 387 detections per processed day (183 days processed).

Table 3.5.2 shows daily and hourly distribution of detections for ARCESS.

Events automatically located by ARCESS

During days 091, 1994, through 273, 1994, 4328 local and regional events were located by ARCESS, based on automatic association of P- and S-type arrivals. This gives an average 23.7 events per processed day (183 days processed). 56% of these events are within 300 km, and 87% of these events are within 1000 km.

FINESS detections

The number of detections (phases) reported during day 091, 1994, through day 273, 1994, was 40,602, giving an average of 226 detections per processed day (180 days processed).

Table 3.5.3 shows daily and hourly distribution of detections for FINESS.

Events automatically located by FINESS

During days 091, 1994, through 273, 1994, 2265 local and regional events were located by FINESS, based on automatic association of P- and S-type arrivals. This gives an average of 12.6 events per processed day (180 days processed). 77% of these events are within 300 km, and 92% of these events are within 1000 km.

GERESS detections

The number of detections (phases) reported from day 091, 1994, through day 273, 1994, was 41,905, giving an average of 235 detections per processed day (178 days processed).

Table 3.5.4 shows daily and hourly distribution of detections for GERESS.

Events automatically located by GERESS

During days 091, 1994, through 273, 1994, 3743 local and regional events were located by GERESS, based on automatic association of P- and S-type arrivals. This gives an average of 21.0 events per processed day (178 days processed). 72% of these events are within 300 km, and 89% of these events are within 1000 km.

Apatity array detections

The number of detections (phases) reported from day 091, 1994, through day 273, 1994, was 124,718, giving an average of 931 detections per processed day (134 days processed).

As described in earlier reports, the data from the Apatity array are transferred by one-way (simplex) radio links to Apatity city. The transmission suffers from radio disturbances that

occasionally result in a large number of small data gaps and spikes in the data. In order for the communication protocol to correct such errors by requesting retransmission of data, a two-way radio link would be needed (duplex radio). However, it should be noted that noise from cultural activities and from the nearby lakes cause most of the unwanted detections. These unwanted detections are "filtered" in the signal processing, as they give seismic velocities that are outside accepted limits for regional and teleseismic phase velocities.

Table 3.5.5 shows daily and hourly distribution of detections for the Apatity array.

Events automatically located by the Apatity array

During days 091, 1994, through 273, 1994, 1489 local and regional events were located by the Apatity array, based on automatic association of P- and S-type arrivals. This gives an average of 11.1 events per processed day (134 days processed). 34% of these events are within 300 km, and 70% of these events are within 1000 km.

Spitsbergen array detections

The number of detections (phases) reported from day 091, 1994, through day 273, 1994, was 66,989, giving an average of 381 detections per processed day (176 days processed).

Table 3.5.6 shows daily and hourly distribution of detections for the Spitsbergen array.

Events automatically located by the Spitsbergen array

During days 091, 1994, through 273, 1994, 1792 local and regional events were located by the Spitsbergen array, based on automatic association of P- and S-type arrivals. This gives an average of 10.2 events per processed day (176 days processed). 46% of these events are within 300 km, and 78% of these events are within 1000 km.

U. Baadshaug

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	2	2	6	2	5	1	4	10	14	10	2	14	4	11	13	19	8	8	6	6	3	5	8	3	166	Apr 01 Friday
92	0	5	8	5	2	5	4	7	3	5	7	21	25	6	21	24	16	9	0	4	4	2	5	3	191	Apr 02 Saturday
93	4	8	5	3	3	2	7	6	9	9	2	5	7	8	2	5	5	3	4	2	1	6	7	2	115	Apr 03 Sunday
94	10	6	6	9	3	7	4	0	7	7	8	6	2	15	4	6	1	4	4	1	1	7	0	5	123	Apr 04 Monday
95	3	2	6	0	1	0	2	0	3	7	11	6	7	15	5	3	0	7	0	4	3	6	2	5	98	Apr 05 Tuesday
96	3	4	3	4	9	8	2	12	3	5	3	7	19	9	14	3	9	16	10	9	14	3	1	4	174	Apr 06 Wednesday
97	4	3	3	3	1	2	4	2	5	9	2	12	9	9	10	14	9	7	1	4	14	8	14	4	153	Apr 07 Thursday
98	7	22	17	13	10	4	0	3	5	5	7	11	7	8	9	5	4	7	4	24	3	6	5	4	190	Apr 08 Friday
99	4	8	11	4	7	15	6	5	3	13	8	16	19	8	2	6	7	0	1	3	3	8	22	41	220	Apr 09 Saturday
100	35	18	1	4	7	2	6	8	1	3	1	3	3	13	4	4	2	14	10	4	3	7	3	9	165	Apr 10 Sunday
101	20	27	32	26	19	2	0	2	2	10	5	13	11	7	5	6	6	3	16	8	7	3	6	4	240	Apr 11 Monday
102	12	16	24	13	10	1	3	3	4	1	8	14	19	26	8	8	6	4	6	15	7	6	7	8	229	Apr 12 Tuesday
103	20	14	20	33	24	3	4	5	5	9	9	16	6	20	9	5	7	5	21	6	3	3	10	3	260	Apr 13 Wednesday
104	0	2	3	8	8	3	2	1	2	8	6	25	18	16	11	11	5	6	7	4	4	11	4	5	170	Apr 14 Thursday
105	1	1	8	1	5	4	2	3	14	5	1	14	5	9	7	2	2	0	12	3	12	2	1	12	126	Apr 15 Friday
106	1	8	5	3	3	3	4	5	6	4	10	6	3	3	5	10	5	8	1	2	2	6	2	8	113	Apr 16 Saturday
107	1	5	4	4	3	4	6	1	7	3	5	5	4	4	3	5	3	4	1	1	16	4	3	2	98	Apr 17 Sunday
108	4	28	15	10	7	1	1	0	4	2	5	6	9	9	10	8	5	18	10	3	27	3	15	3	203	Apr 18 Monday
109	6	5	4	3	4	3	3	2	3	8	7	19	3	3	5	3	11	9	6	10	6	1	1	3	128	Apr 19 Tuesday
110	6	2	7	5	6	5	1	27	9	5	11	9	9	7	7	13	13	10	27	4	10	3	5	5	206	Apr 20 Wednesday
111	10	3	5	2	12	1	4	1	7	3	2	13	5	11	15	7	8	14	8	11	0	3	4	2	151	Apr 21 Thursday
112	2	0	2	2	3	2	10	24	23	6	6	3	14	4	4	0	8	6	3	14	15	2	1	1	155	Apr 22 Friday
113	2	6	0	5	8	3	6	8	1	1	3	5	1	2	7	8	2	5	3	5	0	3	2	4	90	Apr 23 Saturday
114	3	6	5	8	4	2	5	1	1	3	3	0	1	1	2	0	1	5	0	0	3	2	3	2	61	Apr 24 Sunday
115	15	1	2	1	3	0	1	0	0	9	16	7	18	20	14	1	8	4	4	21	0	9	4	6	164	Apr 25 Monday
116	2	0	3	8	13	3	6	8	2	1	6	7	5	13	1	6	6	12	4	12	4	12	8	11	153	Apr 26 Tuesday
117	6	6	7	5	3	2	0	5	6	5	4	10	7	4	13	5	12	3	4	7	4	1	3	6	128	Apr 27 Wednesday
118	12	8	4	2	5	2	4	3	4	10	2	0	14	11	7	10	13	7	8	2	4	3	1	1	137	Apr 28 Thursday
119	0	2	3	0	2	0	40	24	19	11	7	8	3	6	2	4	4	2	7	1	4	0	0	1	150	Apr 29 Friday
120	0	0	1	6	2	6	0	1	3	5	1	7	5	1	3	2	2	1	2	0	2	1	2	3	56	Apr 30 Saturday
121	3	4	1	1	3	3	2	1	1	4	2	0	8	3	4	0	1	1	0	4	8	8	6	6	74	May 01 Sunday
122	2	3	3	6	4	2	5	0	1	8	4	7	9	5	7	2	6	8	13	3	10	6	7	5	126	May 02 Monday
123	5	4	6	6	8	2	3	4	5	12	5	1	12	10	4	6	5	8	8	3	6	5	14	8	150	May 03 Tuesday
124	4	2	5	6	3	4	11	2	5	12	16	5	8	6	6	7	11	7	5	13	6	0	3	2	149	May 04 Wednesday
125	5	2	4	5	2	4	5	3	3	5	7	11	8	5	12	7	5	1	4	12	4	1	3	4	122	May 05 Thursday
126	0	3	1	6	7	3	0	1	1	7	5	9	11	4	8	1	0	0	0	0	0	0	0	0	67	May 06 Friday
127	0	0	0	0	0	0	0	0	2	7	2	4	3	9	3	9	1	1	5	5	2	4	2	3	62	May 07 Saturday
128	3	3	4	1	4	1	0	2	2	5	3	1	1	5	1	1	0	2	2	1	3	1	7	1	54	May 08 Sunday
129	0	3	2	1	3	0	2	6	5	7	7	6	13	9	11	4	8	6	6	6	4	1	3	5	118	May 09 Monday
130	3	1	7	6	7	1	14	11	5	7	8	10	13	10	3	7	7	5	9	17	7	6	0	3	167	May 10 Tuesday
131	1	7	2	0	4	1	7	4	6	7	6	4	12	9	8	2	5	9	7	7	5	14	5	2	134	May 11 Wednesday
132	4	6	1	3	0	1	3	1	3	5	3	3	0	0	1	8	2	0	2	10	0	0	0	0	56	May 12 Thursday
133	0	0	0	0	0	0	1	4	1	3	1	6	8	10	2	6	7	0	4	2	4	1	5	5	70	May 13 Friday
134	4	5	4	2	6	1	6	7	7	3	3	3	2	3	0	7	2	2	0	2	4	5	6	6	90	May 14 Saturday
135	3	3	3	2	2	11	4	2	4	2	2	3	4	4	1	2	2	3	2	3	1	1	2	2	68	May 15 Sunday
136	5	3	2	1	2	3	3	0	3	7	9	1	3	6	3	1	0	0	0	0	0	0	0	0	52	May 16 Monday
137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	May 17 Tuesday
138	0	0	0	0	0	0	3	8	0	11	17	16	21	22	16	7	12	7	5	8	4	6	5	9	177	May 18 Wednesday
139	4	7	5	6	6	4	0	13	4	7	9	7	8	9	5	1	7	3	2	10	1	6	4	5	133	May 19 Thursday
140	2	9	2	3	8	1	0	7	3	8	9	10	6	9	3	3	14	2	7	4	6	6	10	4	136	May 20 Friday
141	5	8	6	15	10	4	4	6	3	7	1	2	4	9	4	3	7	5	3	6	6	4	9	10	141	May 21 Saturday
142	4	9	8	6	9	5	7	7	0	0	1	8	12	9	7	15	10	8	11	10	11	10	12	9	188	May 22 Sunday
143	3	11	12	8	15	13	19	14	8	14	11	16	6	12	10	13	7	21	8	12	12	8	14	12	279	May 23 Monday
144	16	15	17	4	26	2	11	9	2	4	14	10	1	13	9	7	10	6	9	1	4	18	2	5	215	May 24 Tuesday
145	9	6	5	3	8	1	4	12	3	5	6	5	18	15	15	9	7	11	11	13	13	21	29	28	257	May 25 Wednesday
146	13	14	21	33	15	7	15	9	26	11	21	7	11	13	10	10	4	12	6	7	6	6	6	7	290	May 26 Thursday

Table 3.5.1. (Page 1 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	3	6	11	6	5	2	6	5	10	6	1	12	11	27	32	24	23	23	36	31	37	40	38	33	428	May 27 Friday
148	29	43	41	33	26	22	9	10	3	3	10	1	5	10	2	9	8	6	17	6	2	1	8	0	304	May 28 Saturday
149	6	1	3	2	3	3	6	3	3	11	8	2	15	6	11	17	3	4	7	2	11	1	5	11	144	May 29 Sunday
150	4	5	8	7	3	1	1	1	7	5	12	9	16	21	5	5	9	11	11	17	5	2	2	12	179	May 30 Monday
151	5	7	2	0	0	0	0	0	0	0	0	8	11	13	5	8	12	15	21	24	20	12	15	15	193	May 31 Tuesday
152	15	12	16	26	17	6	10	13	13	21	16	22	23	19	22	18	28	27	27	22	23	25	38	37	496	Jun 01 Wednesday
153	40	35	32	37	27	10	10	17	17	19	17	23	18	23	21	29	29	23	29	22	17	34	47	45	621	Jun 02 Thursday
154	39	48	43	40	24	23	16	23	24	26	15	16	11	12	14	15	12	20	22	25	37	23	18	21	567	Jun 03 Friday
155	20	23	21	17	12	16	12	10	18	13	15	24	17	19	26	12	15	21	12	28	24	24	32	24	455	Jun 04 Saturday
156	22	30	33	32	27	48	36	23	23	18	15	9	6	14	10	4	4	5	2	3	0	1	0	3	368	Jun 05 Sunday
157	1	3	2	5	4	3	2	4	6	8	2	8	9	14	8	6	5	3	9	4	10	19	9	7	151	Jun 06 Monday
158	2	2	4	2	8	10	2	6	3	8	5	11	16	20	8	3	3	2	4	5	11	10	1	3	149	Jun 07 Tuesday
159	3	2	2	3	10	1	1	8	1	5	11	9	9	15	3	11	4	5	4	11	5	16	13	8	160	Jun 08 Wednesday
160	26	22	3	8	5	7	7	13	2	5	15	10	10	20	7	3	13	5	4	2	11	16	10	10	234	Jun 09 Thursday
161	9	12	9	27	9	0	4	6	0	8	8	16	14	14	7	11	11	10	8	10	15	5	9	14	236	Jun 10 Friday
162	5	5	3	1	20	17	2	3	1	8	5	2	2	5	23	45	48	45	42	52	41	43	52	57	527	Jun 11 Saturday
163	47	48	39	44	31	36	35	42	42	34	32	23	30	30	26	29	25	22	25	28	29	15	26	18	756	Jun 12 Sunday
164	21	24	17	6	9	0	3	1	1	6	8	6	13	6	10	7	8	15	6	7	7	13	5	7	206	Jun 13 Monday
165	5	10	6	11	10	5	1	9	4	10	5	15	12	12	11	15	12	13	12	12	13	10	6	2	221	Jun 14 Tuesday
166	5	10	12	12	9	5	6	10	10	12	8	12	13	18	19	16	17	20	20	16	6	5	3	3	267	Jun 15 Wednesday
167	2	0	4	7	3	2	1	7	7	9	15	11	13	16	10	2	3	4	6	10	7	9	3	2	153	Jun 16 Thursday
168	1	3	0	14	1	6	5	7	3	13	13	11	14	11	13	7	3	1	1	15	0	19	4	0	165	Jun 17 Friday
169	3	3	4	8	3	6	2	9	7	14	2	2	6	1	4	4	7	2	4	5	2	3	2	4	107	Jun 18 Saturday
170	4	22	29	20	7	3	1	9	1	3	9	5	10	0	7	2	5	4	2	4	5	4	2	3	161	Jun 19 Sunday
171	4	9	2	2	6	1	3	3	8	14	14	0	7	5	8	8	5	6	4	9	2	13	1	9	143	Jun 20 Monday
172	12	5	9	9	12	4	3	5	6	9	10	7	10	9	13	9	4	4	2	11	0	4	1	1	159	Jun 21 Tuesday
173	3	2	2	3	2	2	4	9	5	6	1	6	13	9	15	9	3	2	3	1	10	7	10	2	129	Jun 22 Wednesday
174	2	2	2	4	3	2	9	6	4	4	7	7	15	20	14	4	6	2	6	11	4	9	1	5	149	Jun 23 Thursday
175	7	2	3	2	4	10	8	2	7	7	5	9	6	5	0	9	5	7	2	11	3	12	5	3	134	Jun 24 Friday
176	2	3	1	6	6	11	5	5	10	5	7	5	7	0	4	4	5	9	8	7	4	6	0	5	125	Jun 25 Saturday
177	7	2	0	5	4	0	14	3	2	2	8	6	2	2	3	0	8	4	5	7	1	2	4	1	92	Jun 26 Sunday
178	3	0	3	4	4	3	4	7	7	3	12	10	11	12	19	0	0	0	0	0	0	0	0	0	102	Jun 27 Monday
179	0	7	11	9	5	3	6	5	9	10	15	44	28	0	0	0	0	2	1	0	12	63	47	13	290	Jun 28 Tuesday
180	20	9	10	4	3	2	13	11	13	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	Jun 29 Wednesday
181	0	1	1	4	6	5	10	5	11	11	11	16	9	16	20	10	22	9	11	16	13	19	21	24	271	Jun 30 Thursday
182	23	21	24	20	20	16	17	20	19	29	31	23	23	28	36	38	44	29	40	42	44	37	45	37	706	Jul 01 Friday
183	40	29	34	35	31	30	29	44	28	47	36	43	41	39	52	47	48	48	30	47	39	43	49	35	944	Jul 02 Saturday
184	35	30	17	30	13	7	3	11	0	0	1	3	6	2	21	42	4	0	0	0	2	41	27	11	306	Jul 03 Sunday
185	8	5	3	3	8	1	13	0	6	14	16	30	4	5	3	13	12	14	7	15	3	10	4	0	197	Jul 04 Monday
186	0	0	0	0	0	0	0	0	7	7	13	12	11	12	3	8	11	9	3	12	5	15	2	1	131	Jul 05 Tuesday
187	5	2	5	6	1	1	1	5	7	15	4	12	16	25	7	10	11	6	8	17	6	10	1	2	183	Jul 06 Wednesday
188	1	9	0	3	2	2	7	1	9	7	13	21	17	10	6	12	8	11	4	17	11	1	3	15	190	Jul 07 Thursday
189	4	2	2	3	0	1	7	3	0	5	17	7	11	10	5	12	8	11	15	13	4	17	4	5	166	Jul 08 Friday
190	6	2	7	4	4	8	11	8	1	5	10	11	13	4	8	4	6	9	2	2	5	9	5	8	152	Jul 09 Saturday
191	0	6	7	12	3	6	3	3	12	3	7	1	5	4	3	1	4	1	6	6	3	6	5	7	114	Jul 10 Sunday
192	6	4	4	1	5	1	10	2	2	10	12	16	12	13	5	4	12	7	5	6	16	3	15	2	173	Jul 11 Monday
193	9	4	4	2	9	33	16	22	26	21	18	16	21	11	13	11	9	7	12	12	5	11	9	0	301	Jul 12 Tuesday
194	6	2	18	11	4	16	48	17	18	5	8	13	36	1	11	7	8	6	3	10	4	7	4	1	264	Jul 13 Wednesday
195	12	2	3	3	7	14	24	23	21	9	12	13	20	22	9	10	4	6	12	15	16	10	1	3	271	Jul 14 Thursday
196	6	5	3	1	4	23	25	22	17	17	20	41	12	9	6	5	4	3	5	10	4	1	4	5	252	Jul 15 Friday
197	8	0	3	4	9	13	49	36	45	23	22	38	57	32	6	0	1	6	10	2	5	4	0	3	376	Jul 16 Saturday
198	6	6	3	2	2	1	7	8	6	1	3	2	6	3	6	0	3	8	4	0	2	5	6	3	93	Jul 17 Sunday
199	9	1	10	2	7	1	10	5	17	17	2	6	8	30	28	8	4	3	15	18	2	11	7	1	222	Jul 18 Monday
200	7	4	3	3	7	3	8	8	15	29	20	42	29	20	26	19	10	2	2	9	4	14	5	4	293	Jul 19 Tuesday
201	2	2	7	3	9	10	17	16	15	21	14	15	11	9	8	7	13	3	15	10	11	4	9	2	233	Jul 20 Wednesday
202	4	3	4	2	6	11	19	17	11	7	10	5	10	11	5	13	9	13	17	26	9	17	1	2	232	Jul 21 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	6	6	9	14	9	8	4	8	12	7	22	15	4	8	6	14	8	10	12	1	3	6	9	8	209	Jul 22 Friday
204	5	5	1	9	15	4	17	16	7	7	12	5	5	8	7	4	3	6	8	3	8	7	0	1	163	Jul 23 Saturday
205	3	2	1	2	4	7	7	10	8	29	11	8	2	1	15	4	2	6	7	7	14	7	9	4	170	Jul 24 Sunday
206	3	2	7	3	11	10	7	5	5	4	6	15	5	1	11	3	14	10	4	8	4	5	11	7	161	Jul 25 Monday
207	6	1	0	5	7	10	10	1	3	5	8	9	6	11	8	7	11	6	0	0	1	0	3	3	121	Jul 26 Tuesday
208	5	2	6	6	8	11	5	6	6	3	0	4	13	6	0	0	0	0	13	1	7	0	0	0	102	Jul 27 Wednesday
209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 28 Thursday
210	0	0	0	0	0	0	0	0	0	13	10	2	0	19	7	7	5	9	9	16	6	6	7	5	121	Jul 29 Friday
211	3	8	7	4	4	13	16	3	4	10	24	12	9	12	7	5	10	9	4	6	7	1	6	5	189	Jul 30 Saturday
212	9	4	0	3	8	20	12	4	3	2	5	8	6	1	6	7	5	15	4	6	5	9	6	1	149	Jul 31 Sunday
213	10	11	16	8	6	5	7	9	2	4	5	6	6	10	11	14	12	2	6	10	1	4	10	2	177	Aug 01 Monday
214	4	5	12	11	7	3	9	3	6	7	10	6	11	10	18	5	8	12	5	18	4	10	7	2	193	Aug 02 Tuesday
215	4	10	10	6	5	9	2	5	13	12	10	6	10	15	5	23	10	23	23	19	14	19	7	21	281	Aug 03 Wednesday
216	15	13	17	15	4	12	30	10	13	27	15	4	13	14	12	13	8	31	20	36	16	39	23	21	421	Aug 04 Thursday
217	27	14	10	36	10	8	7	7	14	4	22	20	10	30	23	23	12	9	23	34	13	34	3	4	397	Aug 05 Friday
218	5	19	14	10	9	21	13	4	16	7	3	5	9	11	7	11	11	4	9	5	4	9	4	2	212	Aug 06 Saturday
219	4	9	5	7	7	12	5	6	5	2	8	4	0	7	4	2	5	2	5	1	8	4	3	3	118	Aug 07 Sunday
220	0	0	4	4	5	3	0	4	5	3	5	5	5	7	6	8	14	13	3	21	7	18	5	4	149	Aug 08 Monday
221	4	2	6	6	1	7	16	7	5	13	9	7	13	14	11	7	17	20	3	17	5	15	8	13	226	Aug 09 Tuesday
222	4	4	7	6	3	3	9	4	6	4	3	8	14	7	11	11	13	7	10	8	22	3	2	6	175	Aug 10 Wednesday
223	0	11	5	10	4	6	10	1	4	11	7	11	6	5	9	4	7	7	5	13	2	22	6	9	175	Aug 11 Thursday
224	5	5	7	3	2	2	11	4	11	7	6	9	13	1	13	5	4	4	16	9	1	8	15	3	164	Aug 12 Friday
225	9	9	9	15	12	20	9	12	7	7	6	5	11	8	3	9	6	5	9	2	6	4	7	9	199	Aug 13 Saturday
226	9	21	12	4	4	2	5	10	5	6	8	4	10	12	6	3	5	7	4	8	4	5	1	2	157	Aug 14 Sunday
227	7	7	3	1	2	0	6	2	5	1	6	5	7	11	10	4	10	2	8	7	4	12	1	3	124	Aug 15 Monday
228	2	4	4	9	12	2	6	8	4	4	11	10	19	6	8	7	10	4	8	9	4	6	7	1	165	Aug 16 Tuesday
229	7	2	4	6	4	6	8	10	8	2	8	8	11	10	7	11	13	8	14	10	7	5	4	3	176	Aug 17 Wednesday
230	6	10	1	6	14	29	12	6	11	4	8	8	20	17	17	9	5	5	15	21	6	17	6	4	257	Aug 18 Thursday
231	6	8	2	12	3	3	9	7	10	6	14	8	3	14	8	4	5	14	4	7	0	22	3	8	180	Aug 19 Friday
232	5	3	11	2	5	12	4	7	5	2	5	7	16	12	12	2	4	3	5	10	11	7	4	7	161	Aug 20 Saturday
233	4	2	10	1	14	11	4	5	8	4	5	3	6	6	3	7	9	5	13	5	4	9	3	9	150	Aug 21 Sunday
234	2	5	6	4	7	3	5	4	3	10	7	13	15	8	4	7	6	5	5	16	3	17	7	4	166	Aug 22 Monday
235	7	4	8	5	2	4	3	1	2	4	6	4	11	7	24	2	6	8	12	4	5	15	0	3	147	Aug 23 Tuesday
236	5	8	13	1	8	4	2	9	8	3	12	5	16	8	13	7	11	12	12	15	7	11	11	6	207	Aug 24 Wednesday
237	11	10	16	16	10	17	8	15	3	16	12	6	12	20	18	11	14	7	5	14	3	16	3	4	267	Aug 25 Thursday
238	4	1	6	7	2	1	2	1	4	3	7	12	1	2	9	5	7	5	5	5	2	3	14	3	111	Aug 26 Friday
239	1	4	5	4	0	5	5	7	5	6	5	6	0	4	2	14	8	3	3	2	3	3	0	6	101	Aug 27 Saturday
240	1	6	1	3	3	4	3	4	5	4	1	1	5	2	8	12	4	8	11	7	6	9	8	3	119	Aug 28 Sunday
241	11	8	7	4	4	0	2	5	5	15	3	16	10	11	18	20	9	12	10	8	1	15	2	7	203	Aug 29 Monday
242	3	3	7	8	5	4	9	7	6	7	6	10	22	8	16	19	16	11	2	18	5	15	6	2	215	Aug 30 Tuesday
243	3	5	8	8	5	8	3	1	7	10	10	13	5	16	10	16	14	6	9	11	8	21	3	13	213	Aug 31 Wednesday
244	7	19	1	16	1	3	0	8	12	6	2	17	24	10	9	12	20	12	8	16	8	23	6	8	248	Sep 01 Thursday
245	6	1	8	4	3	3	5	2	2	3	5	8	2	2	12	5	0	0	0	0	0	0	0	0	71	Sep 02 Friday
246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 03 Saturday
247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 04 Sunday
248	0	0	0	0	0	0	1	3	1	5	5	10	13	22	13	5	12	13	6	14	19	13	15	1	171	Sep 05 Monday
249	6	4	13	9	2	10	9	3	22	13	5	14	6	13	14	8	12	6	3	17	8	9	8	4	218	Sep 06 Tuesday
250	9	3	5	15	13	1	0	4	2	5	3	7	10	11	11	13	7	5	2	11	4	23	3	11	178	Sep 07 Wednesday
251	6	10	6	10	1	5	7	5	13	17	14	11	14	14	16	17	10	7	5	9	5	22	7	8	239	Sep 08 Thursday
252	3	10	11	4	3	4	5	8	11	8	6	6	6	15	10	14	3	3	3	13	1	11	2	6	166	Sep 09 Friday
253	2	4	2	4	1	6	4	16	2	8	7	7	8	21	34	52	34	40	46	44	42	51	42	58	535	Sep 10 Saturday
254	42	44	40	35	34	42	41	30	34	35	35	39	40	20	31	30	23	27	19	16	15	10	12	12	706	Sep 11 Sunday
255	13	3	5	2	12	4	3	4	3	10	12	13	8	6	5	8	8	10	4	10	5	12	4	10	174	Sep 12 Monday
256	9	8	11	7	13	3	1	2	3	8	12	12	17	7	11	4	9	11	9	15	7	7	8	12	206	Sep 13 Tuesday
257	5	3	6	12	7	2	4	1	12	8	4	10	15	9	16	3	14	9	18	19	7	13	6	7	210	Sep 14 Wednesday
258	4	6	7	6	3	2	5	8	6	4	3	5	4	6	13	11	2	7	6	10	7	10	1	5	141	Sep 15 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	3	0	3	11	4	0	14	2	5	6	15	3	12	4	5	11	12	18	22	33	32	31	27	34	307	Sep 16 Friday
260	30	36	27	26	26	34	7	12	11	5	7	6	6	5	13	11	9	11	13	12	10	5	11	8	341	Sep 17 Saturday
261	5	4	8	10	2	1	10	8	4	8	8	2	6	8	11	5	5	11	9	3	7	5	3	3	146	Sep 18 Sunday
262	1	2	3	5	5	1	2	5	2	3	3	14	3	2	15	16	9	19	3	12	3	8	7	8	151	Sep 19 Monday
263	8	2	7	4	3	6	4	3	6	2	4	14	2	8	7	9	7	7	6	7	10	10	4	3	143	Sep 20 Tuesday
264	3	12	2	6	1	3	2	2	3	3	6	18	16	3	8	7	4	7	3	10	2	11	1	2	135	Sep 21 Wednesday
265	1	12	21	1	0	0	1	11	1	3	2	17	7	7	12	12	9	10	8	7	3	1	11	2	159	Sep 22 Thursday
266	3	3	9	8	9	6	1	3	1	3	6	15	12	7	10	2	11	4	1	12	8	23	2	4	163	Sep 23 Friday
267	8	6	9	9	11	8	7	4	7	14	13	15	4	5	3	10	2	11	8	9	3	2	10	4	182	Sep 24 Saturday
268	15	0	2	6	7	2	3	7	8	7	9	10	7	12	5	3	9	4	5	8	5	11	8	14	167	Sep 25 Sunday
269	8	11	12	11	6	3	2	2	3	3	9	7	4	18	5	15	10	14	8	4	6	11	4	14	190	Sep 26 Monday
270	5	4	2	2	11	0	12	1	12	6	20	4	15	10	9	10	6	8	7	2	4	4	14	6	174	Sep 27 Tuesday
271	2	1	3	12	2	7	2	5	9	8	20	7	14	5	8	6	14	22	4	4	10	8	11	3	187	Sep 28 Wednesday
272	4	13	5	11	4	7	4	4	7	9	4	13	6	14	18	11	10	13	2	5	7	2	8	5	186	Sep 29 Thursday
273	8	5	3	16	3	7	3	6	5	15	14	8	10	6	15	15	11	13	0	6	19	4	10	11	213	Sep 30 Friday
NRS	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	1308	1382	1398	1432	1255	1122	1312	1288	1314	1531	1560	1815	1896	1862	1774	1638	1549	1539	1478	1818	1391	1813	1426	1344	36245	Total sum
179	7	8	8	8	7	6	7	7	7	9	9	10	11	10	10	9	9	9	8	10	8	10	8	8	202	Total average
125	7	7	7	7	6	5	7	6	7	9	9	11	11	11	10	9	9	9	8	11	8	11	8	7	199	Average workdays
54	9	10	9	9	9	10	9	9	8	9	8	8	9	8	9	10	8	9	8	8	8	8	9	9	211	Average weekends

Table 3.5.1. Daily and hourly distribution of NORESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	8	5	8	5	3	11	13	32	29	21	7	18	16	21	20	9	19	14	10	11	6	5	21	5	317	Apr 01 Friday
92	9	9	12	6	6	13	3	8	17	4	24	17	11	7	7	13	7	5	18	9	5	6	11	2	229	Apr 02 Saturday
93	3	10	5	7	2	3	0	14	10	20	3	5	13	14	2	6	17	12	5	11	9	12	26	5	214	Apr 03 Sunday
94	2	4	5	6	6	1	12	11	8	7	8	8	13	3	6	19	15	34	14	15	10	6	18	6	237	Apr 04 Monday
95	6	10	3	4	4	7	10	4	17	23	10	16	7	14	6	21	5	6	5	4	7	10	12	2	213	Apr 05 Tuesday
96	4	5	2	8	6	24	8	15	4	17	12	34	17	11	9	19	7	9	5	4	14	9	18	4	265	Apr 06 Wednesday
97	6	4	8	12	12	11	13	7	9	10	19	20	11	13	5	9	9	16	9	18	10	7	20	10	268	Apr 07 Thursday
98	12	13	8	10	12	8	25	18	21	21	24	28	19	21	17	15	14	4	13	17	12	9	23	11	375	Apr 08 Friday
99	46	50	98	14	13	15	5	9	9	23	18	21	15	12	10	16	13	7	3	8	19	19	24	16	483	Apr 09 Saturday
100	9	9	8	10	13	23	13	12	11	20	10	6	11	18	7	18	20	23	9	12	7	7	21	6	303	Apr 10 Sunday
101	2	12	13	7	9	4	8	26	21	68	106	124	21	14	21	14	94	25	107	77	141	131	34	11	1090	Apr 11 Monday
102	12	15	20	21	12	6	6	18	17	11	17	20	27	16	24	10	4	9	21	12	12	7	19	4	340	Apr 12 Tuesday
103	17	4	6	5	13	4	6	12	14	16	19	18	13	12	7	23	20	23	5	5	10	12	24	4	292	Apr 13 Wednesday
104	5	1	8	20	7	3	14	26	6	7	30	41	32	16	25	10	7	14	15	9	14	11	19	5	345	Apr 14 Thursday
105	12	10	9	14	6	13	20	13	19	23	13	39	19	13	7	2	8	7	23	15	16	11	24	7	343	Apr 15 Friday
106	10	5	22	10	21	19	10	4	15	19	20	9	4	17	12	13	16	3	23	5	13	13	18	8	309	Apr 16 Saturday
107	1	7	3	4	15	13	14	3	20	9	4	8	13	10	19	11	3	7	12	3	5	4	22	4	214	Apr 17 Sunday
108	7	5	1	6	9	3	13	21	12	11	17	20	21	6	13	15	9	21	6	8	7	10	13	9	263	Apr 18 Monday
109	6	7	6	1	12	8	10	6	16	14	17	22	14	10	15	15	9	10	12	11	12	9	24	9	275	Apr 19 Tuesday
110	19	5	7	9	3	4	5	29	18	25	26	24	29	15	14	8	9	13	18	10	10	10	27	13	350	Apr 20 Wednesday
111	24	12	20	17	14	9	12	18	15	9	11	33	27	15	4	31	10	17	19	6	19	21	45	41	449	Apr 21 Thursday
112	23	38	38	27	25	16	14	22	26	16	18	12	19	17	9	4	11	8	6	14	11	4	12	3	393	Apr 22 Friday
113	10	5	2	11	10	11	5	3	10	4	25	14	15	8	15	19	8	4	8	12	8	4	12	5	228	Apr 23 Saturday
114	5	8	15	6	9	4	1	9	6	8	14	8	5	20	5	5	7	4	4	13	12	11	22	8	209	Apr 24 Sunday
115	13	5	6	7	11	3	6	8	7	9	10	15	11	10	9	8	4	8	7	10	7	5	19	5	203	Apr 25 Monday
116	5	13	8	10	6	5	6	10	14	13	11	8	17	26	6	6	15	16	18	19	15	4	12	12	275	Apr 26 Tuesday
117	12	6	4	10	3	4	7	7	5	28	14	33	20	15	14	14	6	6	8	8	18	6	20	1	269	Apr 27 Wednesday
118	5	5	4	5	17	8	28	16	10	11	9	22	18	25	13	12	24	16	17	14	17	9	25	7	337	Apr 28 Thursday
119	9	9	5	26	7	11	31	34	23	21	22	34	25	9	15	17	14	9	16	4	8	11	27	14	401	Apr 29 Friday
120	44	12	3	17	15	10	4	8	10	15	24	20	9	11	10	15	26	37	38	57	52	67	101	85	690	Apr 30 Saturday
121	94	94	71	69	55	40	33	28	38	27	29	31	34	13	7	2	70	93	47	70	85	62	47	56	1195	May 01 Sunday
122	61	51	67	61	53	71	53	4	4	10	18	32	32	24	14	13	15	25	15	19	22	5	23	7	699	May 02 Monday
123	7	24	23	38	43	34	55	37	37	11	20	20	15	5	19	53	71	19	10	6	13	13	23	9	605	May 03 Tuesday
124	6	23	4	6	12	18	24	16	24	36	42	61	41	20	17	26	16	17	24	15	14	11	20	10	503	May 04 Wednesday
125	5	8	3	10	10	11	14	17	16	15	26	27	20	15	11	11	11	4	8	15	8	11	25	8	309	May 05 Thursday
126	5	9	8	6	6	8	17	18	11	26	8	25	14	12	20	31	17	15	13	18	8	6	21	5	327	May 06 Friday
127	8	17	10	4	5	5	11	11	11	14	19	20	7	15	22	17	9	12	14	8	10	9	23	8	289	May 07 Saturday
128	3	7	4	16	11	10	0	7	17	6	7	11	4	23	13	12	12	18	17	9	19	6	18	7	257	May 08 Sunday
129	3	2	1	2	9	6	8	6	9	11	16	15	23	12	18	8	7	13	10	8	7	19	14	5	232	May 09 Monday
130	5	4	17	6	10	10	21	25	18	16	17	9	11	14	8	10	5	8	13	9	9	9	19	7	280	May 10 Tuesday
131	7	10	3	4	3	2	9	14	20	5	26	9	21	11	4	18	7	8	15	8	15	14	25	5	263	May 11 Wednesday
132	9	10	7	8	8	2	11	12	11	9	12	12	12	20	14	30	16	28	16	18	15	6	26	6	318	May 12 Thursday
133	10	6	5	6	7	7	19	22	21	23	31	42	18	8	4	20	12	6	8	9	11	10	20	11	336	May 13 Friday
134	10	10	1	9	6	6	10	13	11	8	10	13	6	11	3	12	1	4	12	8	9	11	23	6	213	May 14 Saturday
135	4	5	2	7	18	12	7	4	4	9	9	11	18	15	21	8	7	10	21	25	54	64	95	93	523	May 15 Sunday
136	100	60	31	25	33	16	43	41	29	17	17	18	10	11	9	11	20	3	13	10	10	7	13	3	550	May 16 Monday
137	9	1	8	2	1	4	3	10	9	13	5	13	12	7	13	9	5	2	7	10	6	12	24	13	198	May 17 Tuesday
138	7	1	13	9	13	4	26	28	21	27	29	26	20	28	33	37	42	58	18	12	21	8	17	4	502	May 18 Wednesday
139	3	3	13	10	12	4	13	9	17	17	34	16	19	15	14	35	18	9	9	10	33	19	28	10	370	May 19 Thursday
140	11	10	6	6	25	7	22	21	33	19	37	52	33	13	10	19	9	9	22	12	11	2	20	26	435	May 20 Friday
141	50	21	10	9	6	5	13	4	6	15	12	22	8	17	12	13	11	11	4	9	15	6	24	17	320	May 21 Saturday
142	11	9	4	6	3	17	19	7	14	5	8	14	5	13	4	12	6	7	3	12	9	13	22	5	228	May 22 Sunday
143	1	11	4	2	7	7	17	17	10	9	5	16	3	8	3	10	4	15	8	6	7	2	23	3	198	May 23 Monday
144	2	4	25	8	26	11	16	6	13	4	15	16	27	13	18	18	15	14	24	2	8	17	29	6	337	May 24 Tuesday
145	13	7	13	7	14	7	13	13	19	17	13	35	20	11	17	19	10	10	16	18	23	18	30	12	375	May 25 Wednesday
146	30	11	11	7	17	2	9	21	26	16	24	24	17	14	25	11	6	11	20	5	1	2	25	1	336	May 26 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	4	16	6	9	9	2	10	12	6	12	23	30	13	8	10	3	11	5	20	12	9	5	19	12	266	May 27 Friday
148	13	8	15	8	5	5	7	17	12	8	34	13	9	7	9	18	8	4	20	10	9	11	24	3	277	May 28 Saturday
149	5	4	8	4	7	4	5	3	6	7	3	2	12	3	7	10	7	4	8	13	6	8	20	6	162	May 29 Sunday
150	7	9	5	8	9	7	6	12	9	4	14	17	10	18	16	8	14	14	13	15	19	26	23	7	290	May 30 Monday
151	4	2	3	5	5	6	7	6	4	12	8	22	20	23	18	23	25	39	22	19	19	5	30	14	341	May 31 Tuesday
152	4	3	15	12	3	6	7	22	28	14	16	26	18	21	35	53	67	51	30	6	6	13	12	3	471	Jun 01 Wednesday
153	0	0	9	6	7	2	7	37	12	20	15	13	33	28	6	22	46	20	42	7	7	5	28	4	376	Jun 02 Thursday
154	3	7	1	5	5	10	21	47	35	17	27	22	22	14	14	8	10	2	14	5	29	22	24	11	375	Jun 03 Friday
155	4	20	11	6	4	2	8	17	12	5	8	21	9	8	6	6	7	2	3	10	6	10	14	6	205	Jun 04 Saturday
156	7	16	10	2	6	7	7	8	2	8	3	3	10	2	7	3	7	4	7	1	4	1	13	2	140	Jun 05 Sunday
157	5	5	2	6	2	5	4	11	11	22	12	19	10	5	18	19	17	11	7	12	16	16	20	11	266	Jun 06 Monday
158	4	4	9	8	13	9	24	16	13	10	19	16	19	18	24	13	17	13	18	24	12	12	16	14	345	Jun 07 Tuesday
159	4	4	5	7	8	10	6	15	12	13	25	22	15	10	4	3	3	8	11	6	13	10	17	6	237	Jun 08 Wednesday
160	21	38	6	5	4	12	17	17	34	34	39	23	12	7	9	10	23	8	22	8	8	3	21	13	394	Jun 09 Thursday
161	6	10	6	25	2	3	21	19	10	21	36	32	24	17	14	21	4	11	8	16	7	33	22	9	377	Jun 10 Friday
162	3	8	0	2	8	9	8	6	11	32	21	26	7	11	34	23	26	22	22	11	4	3	17	3	317	Jun 11 Saturday
163	5	8	3	3	12	5	3	14	18	9	20	15	9	18	13	8	12	12	14	6	20	10	20	13	270	Jun 12 Sunday
164	12	20	6	8	9	15	19	17	12	17	16	21	10	13	28	29	27	15	14	12	13	12	18	17	380	Jun 13 Monday
165	9	6	4	10	4	7	4	13	14	8	7	10	6	5	8	10	7	7	32	8	14	9	10	4	216	Jun 14 Tuesday
166	12	12	14	16	10	10	16	25	32	37	36	31	16	13	12	14	13	18	25	7	7	2	16	12	406	Jun 15 Wednesday
167	12	10	7	6	13	10	18	12	19	17	36	20	32	22	20	23	19	38	44	11	6	8	11	0	414	Jun 16 Thursday
168	0	0	0	0	14	27	26	27	50	35	41	39	19	35	16	12	10	9	15	7	7	7	19	9	424	Jun 17 Friday
169	13	4	9	27	20	9	14	18	18	10	33	26	53	34	20	41	14	8	23	12	17	9	28	21	481	Jun 18 Saturday
170	4	4	16	18	11	8	13	12	19	24	22	23	18	23	21	17	17	9	13	11	20	10	24	16	373	Jun 19 Sunday
171	7	5	14	16	24	8	29	70	33	46	39	37	22	22	19	21	11	9	7	11	9	3	12	1	475	Jun 20 Monday
172	2	7	13	7	19	5	39	50	21	44	30	42	37	21	31	17	16	12	15	14	7	11	13	5	478	Jun 21 Tuesday
173	2	8	5	11	13	1	16	24	29	32	21	47	40	25	16	24	16	12	21	19	32	22	14	12	462	Jun 22 Wednesday
174	4	6	9	9	14	15	18	30	14	30	25	23	23	23	13	14	15	7	24	8	6	8	25	6	369	Jun 23 Thursday
175	10	4	3	3	11	8	10	11	12	15	22	15	12	19	3	16	4	4	9	6	7	16	14	7	241	Jun 24 Friday
176	4	3	11	16	10	6	14	9	24	9	10	26	19	20	14	12	15	2	6	6	4	20	12	1	273	Jun 25 Saturday
177	6	5	4	10	16	9	14	10	12	11	14	41	17	21	17	14	17	15	12	7	8	19	15	20	334	Jun 26 Sunday
178	7	4	8	8	8	5	39	24	8	23	25	11	5	7	10	6	8	13	18	12	12	15	26	13	315	Jun 27 Monday
179	7	10	8	19	13	15	23	46	21	28	24	27	22	20	27	20	41	14	21	22	19	16	21	15	499	Jun 28 Tuesday
180	11	8	20	14	8	15	13	26	13	20	25	35	27	21	14	15	20	9	18	12	26	6	16	10	402	Jun 29 Wednesday
181	16	5	10	7	11	20	13	22	17	28	26	8	21	12	15	5	9	4	10	6	13	10	23	10	321	Jun 30 Thursday
182	6	3	7	2	8	16	17	22	18	39	58	20	13	14	17	24	6	17	24	14	22	14	22	18	421	Jul 01 Friday
183	12	5	6	13	11	23	25	24	14	43	21	33	19	11	14	8	12	9	13	6	14	16	8	5	365	Jul 02 Saturday
184	5	6	14	13	18	13	7	16	9	13	21	16	11	10	19	12	10	16	7	13	10	6	5	3	273	Jul 03 Sunday
185	5	5	5	6	18	16	23	10	22	26	27	21	26	27	18	21	32	21	18	0	0	0	0	0	347	Jul 04 Monday
186	0	0	0	0	0	1	15	11	29	18	29	45	29	22	20	19	22	2	21	7	5	12	22	4	333	Jul 05 Tuesday
187	7	11	7	8	6	9	16	25	19	21	25	26	26	22	14	25	19	27	21	17	10	6	22	17	406	Jul 06 Wednesday
188	25	15	10	24	9	12	17	16	0	0	0	0	0	0	6	23	17	9	14	10	22	8	22	14	273	Jul 07 Thursday
189	5	13	22	12	16	10	23	16	17	25	34	32	38	27	10	16	15	10	8	15	13	14	16	9	416	Jul 08 Friday
190	15	13	8	13	9	11	15	21	16	31	20	25	13	9	13	8	13	13	13	4	8	7	7	4	309	Jul 09 Saturday
191	4	11	11	15	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	66	Jul 10 Sunday
192	5	5	5	6	15	20	16	18	17	33	29	35	38	25	9	18	15	19	22	13	11	15	14	13	416	Jul 11 Monday
193	6	3	11	15	15	8	42	13	23	31	47	38	38	23	16	12	23	23	16	13	13	5	13	10	457	Jul 12 Tuesday
194	11	9	16	58	36	21	24	23	14	16	25	47	25	11	12	31	20	29	34	11	15	14	21	15	538	Jul 13 Wednesday
195	16	10	9	9	18	20	20	24	43	29	27	44	29	25	22	17	25	22	31	25	28	13	18	10	534	Jul 14 Thursday
196	2	6	6	3	10	9	23	26	15	18	24	47	17	26	10	14	9	5	21	12	11	4	12	12	342	Jul 15 Friday
197	15	14	10	11	22	4	9	7	11	31	31	29	48	25	16	10	5	17	20	2	1	3	5	4	350	Jul 16 Saturday
198	5	6	0	10	10	3	7	4	22	25	21	28	16	7	22	20	8	16	15	6	15	11	16	7	300	Jul 17 Sunday
199	10	3	12	13	16	10	19	42	33	30	28	52	23	24	26	25	17	16	15	21	8	13	15	12	483	Jul 18 Monday
200	8	6	2	17	8	11	25	14	28	43	43	41	24	17	11	21	13	9	28	11	11	15	16	0	422	Jul 19 Tuesday
201	9	2	17	9	10	6	12	27	22	6	63	60	61	46	7	35	20	11	0	45	19	21	12	4	524	Jul 20 Wednesday
202	6	10	6	13	19	10	21	35	44	24	34	27	36	46	36	48	39	23	38	29	41	31	18	3	637	Jul 21 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	9	7	8	4	3	9	21	33	37	28	35	51	35	33	16	17	14	22	14	11	5	7	14	14	447	Jul 22 Friday
204	2	2	4	22	15	8	17	17	22	29	34	17	29	14	6	10	8	10	10	10	11	7	5	4	313	Jul 23 Saturday
205	12	7	6	8	13	6	27	20	18	21	27	51	27	8	30	13	12	16	24	8	18	13	13	5	403	Jul 24 Sunday
206	4	7	11	15	15	11	20	28	19	21	41	37	38	24	12	29	19	39	23	10	5	7	37	18	490	Jul 25 Monday
207	2	4	4	9	19	11	12	7	22	27	32	44	26	23	15	14	7	21	27	24	6	3	17	6	382	Jul 26 Tuesday
208	4	2	7	6	8	12	8	15	21	29	38	37	27	25	18	33	19	22	22	21	13	14	14	7	422	Jul 27 Wednesday
209	7	10	4	6	14	7	8	16	7	41	16	34	38	24	13	10	10	11	15	28	8	11	23	15	376	Jul 28 Thursday
210	19	8	7	14	15	24	15	12	34	22	30	46	27	19	12	25	16	5	21	15	10	14	28	6	444	Jul 29 Friday
211	9	13	4	6	10	7	9	15	21	23	59	49	2	22	20	10	7	15	16	2	10	20	12	2	363	Jul 30 Saturday
212	5	6	3	3	6	18	29	16	14	31	35	30	20	23	11	27	9	15	8	20	6	8	7	6	356	Jul 31 Sunday
213	11	11	10	14	14	10	11	19	35	17	24	17	14	25	26	9	12	6	12	14	15	15	16	11	368	Aug 01 Monday
214	12	9	9	13	18	10	9	10	6	19	23	25	37	17	25	10	14	12	25	20	21	11	16	3	374	Aug 02 Tuesday
215	9	19	27	12	8	15	15	14	12	17	29	25	20	25	17	32	23	15	6	20	10	8	20	4	402	Aug 03 Wednesday
216	2	1	9	7	6	16	15	8	6	35	16	24	22	23	15	10	11	7	8	9	4	14	30	1	299	Aug 04 Thursday
217	4	16	10	21	33	43	23	25	25	32	34	30	24	20	9	12	26	4	18	8	9	12	13	7	458	Aug 05 Friday
218	5	15	7	7	9	10	7	10	19	19	22	9	19	17	17	17	20	20	12	5	9	18	19	8	320	Aug 06 Saturday
219	10	6	6	9	7	2	10	3	18	6	18	23	12	9	10	13	6	7	11	9	6	4	11	6	222	Aug 07 Sunday
220	5	9	4	0	2	8	7	15	13	18	27	27	8	11	15	19	38	85	74	66	67	71	81	78	748	Aug 08 Monday
221	77	59	53	38	48	63	34	28	19	49	23	25	27	31	37	22	13	47	52	72	62	65	73	72	1089	Aug 09 Tuesday
222	53	54	71	63	58	34	37	39	37	42	45	48	24	10	15	29	19	14	21	18	15	10	19	10	785	Aug 10 Wednesday
223	19	18	27	11	12	12	9	7	32	17	28	30	17	29	11	18	23	9	9	23	8	11	20	6	406	Aug 11 Thursday
224	8	1	10	14	14	8	8	16	20	18	38	37	24	30	9	14	10	15	3	17	5	11	29	8	367	Aug 12 Friday
225	5	5	10	11	6	6	17	14	17	35	19	38	65	70	5	8	17	12	7	11	5	9	15	8	415	Aug 13 Saturday
226	9	29	12	9	16	2	12	10	20	16	10	22	10	9	11	5	2	9	8	12	5	5	10	7	260	Aug 14 Sunday
227	8	5	4	9	9	6	9	0	0	0	8	33	18	22	6	17	18	17	10	17	14	9	10	12	261	Aug 15 Monday
228	11	4	9	10	11	4	12	30	16	22	22	24	22	19	25	12	14	15	10	11	11	7	37	8	366	Aug 16 Tuesday
229	4	4	5	11	13	14	25	36	18	29	19	26	33	16	15	25	13	23	16	20	8	5	31	10	419	Aug 17 Wednesday
230	11	12	13	11	37	31	22	16	24	14	26	40	23	31	18	8	8	10	18	18	5	10	17	2	425	Aug 18 Thursday
231	4	6	4	11	11	5	20	21	28	18	38	43	23	10	24	14	16	21	18	21	11	10	28	21	426	Aug 19 Friday
232	14	4	15	16	14	10	9	49	19	24	21	12	7	14	21	8	8	30	18	14	16	18	20	7	388	Aug 20 Saturday
233	5	1	14	8	18	8	11	5	14	10	37	5	3	12	14	17	25	18	15	13	14	8	17	12	304	Aug 21 Sunday
234	9	10	7	6	27	10	8	27	28	14	46	22	50	23	19	23	30	27	33	9	21	19	22	6	496	Aug 22 Monday
235	8	5	8	5	11	20	12	0	0	27	32	28	44	21	26	38	13	14	15	19	33	25	8	7	419	Aug 23 Tuesday
236	4	10	18	9	27	19	26	19	17	24	41	27	22	33	15	23	18	25	17	8	18	12	19	5	456	Aug 24 Wednesday
237	3	6	7	13	14	19	22	11	22	24	33	24	32	25	28	37	22	21	24	20	8	18	10	8	451	Aug 25 Thursday
238	14	0	10	14	8	13	12	24	26	36	42	21	31	30	22	27	14	8	21	2	6	7	22	1	411	Aug 26 Friday
239	6	5	13	16	8	5	18	20	8	16	25	11	10	12	10	9	18	22	12	7	10	11	14	8	294	Aug 27 Saturday
240	6	7	5	4	11	7	15	15	13	13	14	19	9	9	10	21	11	9	16	17	16	18	15	7	287	Aug 28 Sunday
241	12	10	15	7	12	2	18	23	31	34	23	30	27	43	27	26	13	21	19	14	8	11	19	22	467	Aug 29 Monday
242	14	2	1	9	16	6	24	21	10	24	28	17	8	12	16	15	18	11	14	15	10	13	21	8	333	Aug 30 Tuesday
243	6	7	10	10	10	11	10	13	23	21	19	33	15	14	19	28	32	13	25	15	4	4	28	7	377	Aug 31 Wednesday
244	6	14	11	9	16	11	11	12	36	20	18	17	23	25	16	30	43	28	28	14	14	18	19	10	449	Sep 01 Thursday
245	5	11	3	6	12	15	17	31	13	35	22	20	21	24	11	17	48	23	45	32	11	7	26	15	470	Sep 02 Friday
246	13	6	13	16	15	11	18	40	19	46	30	40	31	28	17	25	34	49	48	13	12	8	16	4	552	Sep 03 Saturday
247	8	8	12	5	13	18	7	24	24	40	34	22	25	27	59	20	38	22	29	39	32	16	11	13	546	Sep 04 Sunday
248	7	7	20	26	23	23	21	37	49	45	29	29	28	36	30	46	27	21	38	23	17	12	23	8	625	Sep 05 Monday
249	1	7	1	4	10	15	12	16	14	20	13	22	30	29	30	28	52	11	21	13	16	9	7	15	396	Sep 06 Tuesday
250	4	6	15	7	21	5	38	40	20	26	31	41	26	18	44	19	4	8	14	11	10	16	12	16	452	Sep 07 Wednesday
251	3	6	11	5	14	11	22	16	34	30	13	40	25	14	15	15	39	17	14	8	24	7	16	16	415	Sep 08 Thursday
252	3	8	5	5	13	2	13	11	30	17	13	56	38	20	19	23	7	11	15	12	8	9	16	15	369	Sep 09 Friday
253	11	11	19	6	13	10	9	3	10	23	21	28	6	6	14	8	21	15	29	9	6	9	16	16	319	Sep 10 Saturday
254	3	12	3	3	9	1	15	9	14	20	14	9	10	7	9	4	19	13	13	8	12	7	21	7	242	Sep 11 Sunday
255	1	7	13	7	15	13	25	20	12	21	19	23	13	7	16	20	13	13	23	11	11	4	11	16	334	Sep 12 Monday
256	7	6	6	13	25	15	12	10	21	11	23	44	36	35	27	29	18	17	14	24	21	7	16	10	447	Sep 13 Tuesday
257	10	7	16	8	13	15	24	16	42	18	21	14	21	21	25	15	12	17	15	16	19	4	13	10	392	Sep 14 Wednesday
258	7	8	7	6	11	12	18	11	15	17	18	22	26	10	16	23	30	17	20	15	16	16	14	16	371	Sep 15 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	10	8	8	8	12	5	11	9	24	17	44	30	13	26	12	22	24	22	22	25	13	13	7	13	398	Sep 16 Friday
260	8	11	27	16	12	10	13	18	13	13	18	9	19	23	8	5	8	15	11	13	6	10	10	10	306	Sep 17 Saturday
261	3	13	8	12	4	8	7	7	10	3	7	11	15	17	37	35	25	28	11	2	7	7	12	10	299	Sep 18 Sunday
262	10	13	7	10	10	8	16	19	14	13	12	19	20	28	30	37	26	16	28	9	7	10	14	13	389	Sep 19 Monday
263	18	0	4	12	15	28	31	36	38	41	45	56	60	13	17	26	17	36	18	34	11	17	18	14	605	Sep 20 Tuesday
264	9	7	8	11	16	20	30	32	39	36	47	27	28	30	23	23	6	10	15	10	15	20	11	12	485	Sep 21 Wednesday
265	4	9	4	5	15	24	20	22	35	20	27	17	14	14	22	27	35	16	32	20	26	8	18	13	447	Sep 22 Thursday
266	7	5	17	12	16	43	25	31	30	9	24	24	25	5	2	10	4	13	10	7	5	11	10	11	356	Sep 23 Friday
267	1	6	13	10	7	4	6	4	25	15	13	22	14	20	8	21	13	10	22	10	9	16	16	12	297	Sep 24 Saturday
268	15	12	11	7	9	8	18	9	7	9	5	6	12	8	10	11	8	10	11	6	12	8	9	10	231	Sep 25 Sunday
269	13	2	8	11	15	89	49	10	15	70	86	86	30	37	7	62	11	16	14	20	24	11	11	13	710	Sep 26 Monday
270	14	3	1	7	5	28	44	62	86	45	40	26	52	7	14	44	21	23	18	11	8	12	7	13	591	Sep 27 Tuesday
271	16	4	6	14	20	29	24	33	33	74	30	64	64	43	23	15	0	0	0	0	0	0	0	0	492	Sep 28 Wednesday
272	0	0	0	0	0	0	0	68	72	40	20	20	39	26	16	62	42	8	6	7	2	4	7	8	447	Sep 29 Thursday
273	11	3	3	12	18	73	10	60	27	26	37	55	12	22	15	9	29	6	7	24	8	10	5	17	499	Sep 30 Friday
ARC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum		1804		2026		2244		3403		3863		4857		3301		3324		2828		2567		2325		1973		
	1910		1949		2367		2916		3506		4393		3879		2857		3104		3194		2583		3611		70784	Total sum
183	10	10	11	11	13	12	16	19	19	21	24	27	21	18	16	18	17	15	17	14	14	13	20	11	387	Total average
126	10	9	10	11	14	14	18	21	21	23	27	30	24	19	16	20	18	16	19	15	15	13	20	11	414	Average workdays
57	11	11	11	10	11	9	11	13	14	17	18	19	15	15	14	13	14	15	14	12	13	12	20	11	323	Average weekends

Table 3.5.2. Daily and hourly distribution of ARCESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	8	2	3	5	4	0	1	8	13	14	8	9	8	6	4	2	5	13	10	1	6	2	7	9	148	Apr 01 Friday
92	2	2	7	2	10	6	2	6	3	10	9	15	6	3	1	11	3	4	3	4	1	1	1	5	117	Apr 02 Saturday
93	3	3	6	2	2	5	4	4	4	8	4	6	1	12	2	3	5	6	3	8	9	7	5	2	114	Apr 03 Sunday
94	8	18	11	5	6	9	4	7	9	3	12	14	8	5	8	4	5	13	6	12	16	9	11	9	212	Apr 04 Monday
95	11	24	6	11	2	10	5	5	9	15	9	28	10	14	7	6	11	11	5	8	8	11	8	7	241	Apr 05 Tuesday
96	6	12	5	6	12	6	3	8	12	14	13	21	23	18	6	8	5	10	10	14	14	8	4	4	242	Apr 06 Wednesday
97	12	10	8	8	2	5	6	5	8	13	15	27	9	7	10	16	5	12	7	8	8	7	6	7	221	Apr 07 Thursday
98	10	10	15	9	12	5	6	11	14	9	23	25	14	3	27	8	8	8	13	11	12	9	4	8	274	Apr 08 Friday
99	7	8	11	4	10	2	4	7	11	10	7	10	8	9	10	6	6	7	7	9	6	4	2	7	172	Apr 09 Saturday
100	4	11	7	12	3	2	12	7	6	7	14	7	8	9	9	10	4	11	21	12	17	15	16	21	245	Apr 10 Sunday
101	18	13	22	15	10	6	11	6	5	13	9	18	17	15	8	12	12	7	8	9	15	7	11	13	280	Apr 11 Monday
102	24	11	18	12	1	3	4	9	13	10	26	27	19	14	5	8	8	8	15	7	10	12	9	11	284	Apr 12 Tuesday
103	21	26	27	15	9	4	11	6	8	15	15	23	23	7	11	5	13	15	13	12	9	15	15	12	330	Apr 13 Wednesday
104	19	4	12	15	5	9	10	6	9	8	24	22	18	14	17	5	12	5	15	18	11	6	14	15	293	Apr 14 Thursday
105	15	8	19	7	5	2	6	7	20	21	19	13	10	12	11	14	11	5	8	6	6	4	7	15	251	Apr 15 Friday
106	15	8	13	6	12	11	11	9	6	13	13	2	12	6	9	8	11	10	9	5	4	4	10	10	217	Apr 16 Saturday
107	2	8	6	7	6	5	3	6	15	7	11	6	5	22	9	11	16	10	15	6	16	15	12	9	228	Apr 17 Sunday
108	8	13	7	8	11	4	9	6	7	6	11	15	14	15	6	9	8	14	14	4	6	11	13	7	226	Apr 18 Monday
109	15	9	10	12	3	2	12	5	17	12	11	20	18	18	15	16	11	14	12	8	6	13	10	14	283	Apr 19 Tuesday
110	11	7	17	9	10	7	3	22	8	12	22	15	20	7	13	12	5	13	9	8	16	13	12	16	287	Apr 20 Wednesday
111	15	7	9	9	13	6	3	8	15	12	12	31	8	16	18	13	6	16	17	8	11	7	9	20	289	Apr 21 Thursday
112	11	10	12	17	4	3	9	21	25	17	23	22	10	7	9	8	17	21	11	11	14	12	13	9	316	Apr 22 Friday
113	19	18	5	14	14	13	10	6	18	8	12	12	17	5	12	7	2	7	6	7	3	6	1	7	229	Apr 23 Saturday
114	3	15	10	7	3	6	1	3	5	7	14	7	9	7	7	2	9	13	27	13	17	20	14	11	230	Apr 24 Sunday
115	20	15	15	9	1	1	12	3	6	7	20	8	11	19	15	8	9	14	4	8	7	11	17	13	253	Apr 25 Monday
116	7	10	14	6	5	6	5	15	17	18	12	19	13	14	16	9	13	9	13	13	4	15	15	22	290	Apr 26 Tuesday
117	13	14	16	6	9	4	4	11	27	21	16	23	16	14	12	15	8	7	7	6	7	6	8	18	288	Apr 27 Wednesday
118	14	12	13	8	6	1	7	9	11	10	12	13	15	5	3	8	7	12	10	9	7	9	5	2	208	Apr 28 Thursday
119	4	6	12	6	1	3	17	22	20	14	11	21	6	19	18	4	9	4	5	6	9	3	4	8	232	Apr 29 Friday
120	5	6	14	17	16	5	7	15	12	9	7	6	3	4	19	13	5	7	6	2	4	4	6	5	197	Apr 30 Saturday
121	1	9	4	3	24	16	18	23	15	16	19	16	26	22	26	14	16	5	10	15	14	13	7	12	344	May 01 Sunday
122	15	10	8	10	2	6	3	5	14	6	16	14	9	11	9	7	4	11	14	9	9	9	14	13	228	May 02 Monday
123	19	14	7	10	6	3	7	8	14	10	10	16	11	2	4	5	6	3	4	10	5	7	15	9	205	May 03 Tuesday
124	15	16	6	2	4	1	12	6	5	8	19	11	20	5	8	4	6	5	4	5	7	13	17	11	210	May 04 Wednesday
125	15	13	12	4	1	6	4	7	8	13	15	10	12	8	5	4	2	2	13	13	9	7	19	12	214	May 05 Thursday
126	9	10	8	8	4	0	6	7	8	11	11	13	7	9	3	8	5	7	5	15	1	9	12	13	189	May 06 Friday
127	17	28	5	6	13	9	12	7	7	2	4	5	7	10	8	17	1	5	3	3	2	7	0	8	186	May 07 Saturday
128	1	5	2	5	7	1	7	7	5	4	5	10	5	6	6	10	5	12	25	9	20	16	15	17	205	May 08 Sunday
129	8	22	9	2	3	3	1	13	8	12	10	12	20	8	6	4	5	7	2	16	9	13	17	6	216	May 09 Monday
130	11	16	18	3	8	2	11	15	18	3	10	15	9	9	18	7	12	5	7	14	10	10	10	17	258	May 10 Tuesday
131	7	15	15	8	1	7	3	3	18	7	3	15	15	6	5	5	1	3	5	1	0	0	0	7	150	May 11 Wednesday
132	6	3	9	5	3	2	7	5	16	17	17	11	11	1	6	0	0	0	0	0	0	0	6	7	132	May 12 Thursday
133	10	6	9	8	3	9	16	10	3	19	9	16	14	7	3	12	5	6	13	7	7	6	3	10	211	May 13 Friday
134	19	17	12	10	4	3	3	10	7	4	2	8	9	9	2	11	3	2	7	2	4	2	12	0	162	May 14 Saturday
135	1	5	3	9	6	6	2	2	0	4	6	7	8	1	4	2	3	13	14	13	9	6	5	10	139	May 15 Sunday
136	17	12	4	1	0	2	1	10	10	12	4	9	11	10	4	7	6	12	10	8	15	8	8	15	196	May 16 Monday
137	11	20	20	4	4	3	7	7	5	22	13	8	15	7	18	7	6	3	9	11	10	10	9	11	240	May 17 Tuesday
138	18	12	16	1	12	6	5	9	10	13	26	17	24	22	8	6	8	8	3	12	9	15	10	12	282	May 18 Wednesday
139	16	9	18	2	4	1	4	7	15	14	16	25	10	5	16	5	6	1	14	11	6	6	8	15	234	May 19 Thursday
140	16	11	14	12	3	5	4	8	6	8	16	12	6	6	8	11	6	2	9	7	6	6	7	11	200	May 20 Friday
141	13	4	9	4	1	2	3	3	0	0	3	1	5	7	5	2	3	2	8	4	3	3	3	5	93	May 21 Saturday
142	4	10	3	3	2	4	12	9	11	14	16	15	11	7	5	12	3	5	19	16	7	15	13	12	228	May 22 Sunday
143	6	19	6	1	1	5	11	15	11	9	4	10	10	12	4	15	6	5	9	10	13	10	12	12	216	May 23 Monday
144	7	11	20	4	14	5	8	2	12	15	9	24	12	12	8	4	7	5	4	11	5	20	9	12	240	May 24 Tuesday
145	22	19	20	3	9	2	3	9	12	14	9	11	10	9	5	1	2	3	4	13	9	17	13	10	229	May 25 Wednesday
146	17	13	10	4	8	1	2	8	21	4	18	7	5	5	12	12	6	9	10	3	12	9	8	10	214	May 26 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	11	8	14	1	5	1	3	7	11	7	16	4	3	4	2	6	3	2	4	7	5	16	6	10	156	May 27 Friday
148	6	14	19	6	6	2	5	8	10	9	10	7	7	3	0	1	3	1	3	8	0	6	5	2	141	May 28 Saturday
149	6	12	2	4	15	12	41	6	8	4	10	3	12	10	11	8	2	4	19	11	12	10	15	8	245	May 29 Sunday
150	11	19	15	1	0	2	1	2	5	10	19	13	12	6	10	1	5	6	7	4	4	6	7	4	170	May 30 Monday
151	0	5	7	2	0	2	1	4	10	11	16	9	18	7	12	14	7	16	7	9	13	4	9	10	193	May 31 Tuesday
152	17	6	21	8	11	3	5	10	8	16	13	15	12	9	7	18	11	9	10	11	14	5	12	9	260	Jun 01 Wednesday
153	18	10	14	6	6	3	5	8	12	12	18	37	25	25	15	28	11	21	20	8	6	7	8	7	330	Jun 02 Thursday
154	9	17	21	12	5	13	4	14	10	11	22	18	19	15	12	10	14	15	13	8	16	21	13	19	331	Jun 03 Friday
155	15	16	12	11	10	3	5	10	18	3	5	5	5	15	12	6	9	3	9	12	4	5	3	11	207	Jun 04 Saturday
156	10	13	8	8	3	12	10	9	5	8	11	1	1	11	7	6	5	17	7	14	16	10	8	11	211	Jun 05 Sunday
157	17	17	16	10	9	4	8	5	17	15	18	25	31	9	13	11	9	12	10	5	21	19	21	15	337	Jun 06 Monday
158	16	10	10	5	12	10	9	19	34	21	14	26	35	17	13	6	12	9	14	13	12	10	11	11	349	Jun 07 Tuesday
159	15	14	16	9	3	2	21	15	12	10	12	13	13	0	0	0	0	0	0	0	0	0	0	0	155	Jun 08 Wednesday
160	0	0	0	0	0	0	6	23	24	8	13	14	10	7	9	14	10	15	15	10	14	14	16	14	236	Jun 09 Thursday
161	14	15	13	17	2	2	5	8	4	12	17	22	15	11	9	6	9	7	8	10	11	12	12	13	254	Jun 10 Friday
162	4	16	24	14	15	9	6	6	4	16	11	16	9	9	8	8	18	12	5	7	8	5	3	10	243	Jun 11 Saturday
163	2	10	14	2	2	2	10	10	16	9	6	4	2	8	4	2	7	15	7	12	7	10	7	2	170	Jun 12 Sunday
164	8	6	8	6	3	2	5	7	3	6	21	17	11	7	14	10	7	12	10	8	8	15	9	22	225	Jun 13 Monday
165	16	16	8	14	10	4	8	15	16	12	29	18	28	17	7	7	12	8	7	11	6	26	7	9	311	Jun 14 Tuesday
166	11	22	12	4	4	0	6	4	6	19	19	18	9	14	6	5	4	12	6	10	12	9	6	3	221	Jun 15 Wednesday
167	11	4	15	9	4	8	11	9	5	8	14	13	19	10	11	7	15	7	13	14	15	10	7	6	245	Jun 16 Thursday
168	4	10	10	10	7	4	8	5	9	10	17	20	8	6	9	8	8	9	8	4	5	5	3	2	189	Jun 17 Friday
169	16	9	8	9	20	13	5	28	24	9	8	5	10	9	5	3	9	10	4	3	3	3	6	6	225	Jun 18 Saturday
170	8	5	4	17	5	5	3	0	5	13	6	13	10	23	12	4	7	17	12	20	19	15	14	11	248	Jun 19 Sunday
171	12	7	6	4	7	7	9	7	15	23	37	34	19	19	10	10	8	11	22	15	13	15	2	7	319	Jun 20 Monday
172	15	18	21	10	3	7	7	7	16	11	15	15	19	22	3	8	10	4	11	13	8	10	12	12	277	Jun 21 Tuesday
173	11	11	8	6	7	5	8	7	13	11	15	21	11	10	5	7	8	1	7	9	8	5	5	12	211	Jun 22 Wednesday
174	8	8	7	8	4	4	2	5	2	10	8	15	8	15	9	10	9	10	10	6	7	3	5	4	177	Jun 23 Thursday
175	9	3	6	10	2	5	5	4	2	4	15	12	26	10	6	55	8	2	7	7	1	4	8	2	213	Jun 24 Friday
176	1	4	4	7	4	4	13	26	11	4	6	10	7	9	11	6	8	9	3	3	7	4	1	3	165	Jun 25 Saturday
177	9	3	0	3	5	5	8	14	7	6	20	8	4	6	5	6	6	13	10	20	13	10	10	1	192	Jun 26 Sunday
178	13	19	14	15	8	4	3	12	9	11	8	18	11	13	14	7	5	9	10	7	15	11	6	5	247	Jun 27 Monday
179	10	6	7	8	8	5	5	4	17	6	15	20	9	16	10	3	10	6	13	15	16	7	5	6	227	Jun 28 Tuesday
180	21	16	17	7	4	6	5	11	14	17	16	18	14	6	10	10	10	6	12	13	2	12	10	12	269	Jun 29 Wednesday
181	12	14	14	5	3	3	13	6	9	17	13	15	8	10	5	2	7	9	4	14	9	7	7	4	210	Jun 30 Thursday
182	15	14	14	6	3	6	13	10	19	36	29	11	15	8	11	11	8	5	6	17	8	4	7	5	281	Jul 01 Friday
183	10	5	10	12	2	5	8	12	8	14	3	7	8	7	9	2	5	0	5	6	6	5	2	4	155	Jul 02 Saturday
184	7	5	3	4	5	2	4	8	2	2	8	6	1	5	7	10	9	14	5	12	11	9	11	9	159	Jul 03 Sunday
185	11	12	10	9	6	11	6	5	7	16	10	15	5	15	4	10	20	21	9	10	5	12	11	7	247	Jul 04 Monday
186	10	11	10	12	6	9	5	4	8	13	21	19	18	19	11	14	12	7	10	10	6	11	10	15	271	Jul 05 Tuesday
187	12	15	19	15	7	7	5	5	9	18	10	17	15	14	15	11	7	14	14	9	12	11	12	26	299	Jul 06 Wednesday
188	12	22	16	12	7	6	13	18	15	12	20	21	30	16	28	14	11	6	15	8	11	12	19	11	355	Jul 07 Thursday
189	8	11	10	16	10	10	7	11	9	12	24	20	9	13	10	10	16	10	5	5	10	9	4	5	254	Jul 08 Friday
190	9	7	12	2	4	5	7	2	5	4	4	9	7	6	7	1	11	10	5	4	2	10	5	4	142	Jul 09 Saturday
191	9	8	6	8	3	6	6	6	3	9	3	1	14	5	3	2	6	11	14	11	4	14	6	11	169	Jul 10 Sunday
192	8	17	14	8	6	3	8	3	3	7	10	19	10	5	7	11	7	7	16	10	3	15	12	13	222	Jul 11 Monday
193	17	14	10	4	10	8	7	13	5	20	15	20	12	12	8	18	16	25	14	3	8	16	14	12	301	Jul 12 Tuesday
194	15	14	21	18	4	6	6	8	12	14	16	14	16	13	11	10	9	6	11	13	9	15	9	10	280	Jul 13 Wednesday
195	9	13	7	8	4	7	8	20	16	16	10	24	12	10	9	18	12	9	11	8	8	17	14	21	291	Jul 14 Thursday
196	6	9	9	17	8	9	3	17	19	24	23	6	14	20	11	9	8	8	17	11	4	9	25	14	300	Jul 15 Friday
197	19	41	40	17	14	3	24	25	11	7	9	8	14	25	15	35	3	8	9	1	2	6	5	5	346	Jul 16 Saturday
198	8	8	4	7	2	0	2	4	10	26	8	28	13	26	26	7	6	27	27	22	21	22	23	18	345	Jul 17 Sunday
199	29	8	19	13	19	14	9	15	9	6	15	9	15	14	11	7	9	3	15	7	11	13	8	3	281	Jul 18 Monday
200	6	7	10	6	5	2	6	2	6	6	10	10	13	8	9	16	10	9	10	22	15	13	5	7	213	Jul 19 Tuesday
201	6	13	14	6	4	3	1	8	5	15	3	18	7	12	18	8	11	11	10	10	9	4	5	5	206	Jul 20 Wednesday
202	4	4	5	7	0	0	0	0	0	0	8	7	8	20	8	7	6	8	9	25	13	15	8	8	170	Jul 21 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	4	9	14	9	1	7	6	7	14	6	15	12	18	6	10	6	11	14	11	4	5	12	14	13	228	Jul 22 Friday
204	6	13	15	14	8	10	24	21	9	3	14	22	19	26	34	21	0	5	14	56	26	48	51	31	490	Jul 23 Saturday
205	39	42	21	37	23	10	22	36	27	12	18	17	24	12	24	13	28	26	20	10	23	31	37	11	563	Jul 24 Sunday
206	21	17	31	13	5	2	8	9	10	9	19	16	15	11	14	13	19	12	13	35	16	13	35	15	371	Jul 25 Monday
207	22	31	22	24	28	9	4	3	11	16	21	28	14	14	4	8	11	17	25	16	21	14	37	9	409	Jul 26 Tuesday
208	8	4	8	11	5	9	3	9	18	19	24	31	24	33	13	17	14	20	8	15	14	10	6	6	329	Jul 27 Wednesday
209	10	8	20	12	2	11	5	15	22	13	16	9	15	11	9	11	6	5	12	9	13	15	16	15	280	Jul 28 Thursday
210	18	8	10	10	7	5	4	5	17	24	10	17	21	18	11	13	12	11	12	9	7	12	11	3	275	Jul 29 Friday
211	15	14	7	7	17	7	8	10	13	0	6	9	6	3	7	2	7	4	5	5	3	6	7	2	170	Jul 30 Saturday
212	1	5	7	2	7	16	12	6	6	1	2	6	8	6	4	3	5	12	15	16	13	3	11	7	174	Jul 31 Sunday
213	6	12	25	10	9	8	2	5	11	7	8	15	17	13	9	15	9	8	20	11	6	8	9	9	252	Aug 01 Monday
214	21	9	8	6	5	2	6	8	13	7	16	9	8	7	15	7	5	7	9	11	22	5	14	7	227	Aug 02 Tuesday
215	10	17	17	9	2	4	2	5	2	22	16	10	19	14	18	23	6	14	7	22	9	8	16	6	278	Aug 03 Wednesday
216	18	8	15	5	5	6	9	4	10	19	18	7	21	13	16	8	7	15	19	7	8	13	13	15	279	Aug 04 Thursday
217	22	9	18	7	9	4	6	15	24	20	19	41	23	13	9	12	4	4	6	4	17	4	4	2	296	Aug 05 Friday
218	7	15	7	10	9	5	5	1	6	5	3	4	1	6	10	4	10	15	4	8	7	4	2	4	152	Aug 06 Saturday
219	9	1	1	3	5	8	10	6	9	3	4	2	5	8	2	8	3	1	3	14	7	11	9	5	137	Aug 07 Sunday
220	9	13	5	8	3	13	11	27	18	7	11	12	8	8	3	8	12	7	5	12	4	21	11	10	246	Aug 08 Monday
221	5	10	8	1	2	1	2	6	9	11	14	11	3	11	5	6	5	9	4	7	8	12	5	10	165	Aug 09 Tuesday
222	6	6	10	8	2	0	2	3	9	25	20	12	31	10	4	13	8	6	8	7	10	7	7	4	218	Aug 10 Wednesday
223	8	11	9	12	6	4	17	4	12	14	11	7	14	8	9	6	8	4	8	10	6	11	4	8	211	Aug 11 Thursday
224	7	12	10	2	1	3	4	6	16	7	12	10	15	7	2	9	6	6	4	1	0	0	0	0	140	Aug 12 Friday
225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 13 Saturday
226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 14 Sunday
227	0	0	0	0	3	2	7	2	10	4	5	11	15	15	5	6	5	8	11	7	8	11	3	3	141	Aug 15 Monday
228	5	1	11	7	2	3	6	9	7	8	10	18	15	13	7	6	6	2	5	11	3	8	7	8	178	Aug 16 Tuesday
229	6	13	7	8	10	3	4	15	7	13	16	13	12	5	6	12	9	5	8	4	6	11	9	11	213	Aug 17 Wednesday
230	17	10	6	11	14	18	7	6	12	4	23	12	9	10	5	4	5	5	10	12	7	8	8	13	236	Aug 18 Thursday
231	10	12	10	8	9	6	8	9	10	11	13	12	20	10	12	10	4	6	10	8	12	8	7	12	237	Aug 19 Friday
232	9	6	8	4	5	3	9	2	6	5	12	11	15	8	11	13	5	2	4	8	10	13	4	4	177	Aug 20 Saturday
233	1	9	9	8	9	7	10	5	5	10	7	4	10	6	9	3	9	13	12	7	14	9	12	6	194	Aug 21 Sunday
234	17	8	7	10	5	9	6	7	6	13	13	28	19	6	8	10	6	8	13	16	10	17	12	4	258	Aug 22 Monday
235	11	11	12	12	1	10	15	7	12	10	20	16	29	11	14	8	7	3	17	13	11	13	9	2	274	Aug 23 Tuesday
236	8	11	17	4	8	3	8	9	9	15	15	25	22	12	13	6	9	6	14	7	12	4	10	4	251	Aug 24 Wednesday
237	11	12	5	4	5	2	3	8	5	5	18	16	12	6	5	9	9	3	8	6	3	10	2	9	176	Aug 25 Thursday
238	11	10	16	6	0	3	7	8	8	13	7	17	9	4	5	8	7	2	3	3	1	2	3	11	164	Aug 26 Friday
239	3	9	10	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	Aug 27 Saturday
240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 28 Sunday
241	0	0	0	0	0	2	1	3	7	7	13	19	4	8	9	11	4	3	8	5	4	1	2	6	117	Aug 29 Monday
242	7	5	2	3	2	3	5	8	3	10	3	2	2	0	4	0	0	0	0	0	1	7	11	8	86	Aug 30 Tuesday
243	11	5	5	4	4	2	5	3	17	6	16	20	11	7	4	8	5	6	12	6	3	9	6	12	187	Aug 31 Wednesday
244	2	12	5	7	7	4	6	4	21	5	14	26	20	13	16	21	18	11	6	7	10	7	2	9	253	Sep 01 Thursday
245	10	15	8	5	7	2	7	6	3	11	17	12	12	9	13	2	4	4	7	6	7	8	8	2	185	Sep 02 Friday
246	3	3	12	5	3	4	5	3	7	4	4	3	1	10	5	2	4	4	2	0	3	1	0	2	90	Sep 03 Saturday
247	2	3	4	4	5	6	11	5	11	12	8	12	16	15	8	4	8	1	5	8	8	10	6	4	176	Sep 04 Sunday
248	7	5	9	4	4	9	5	6	5	3	5	17	10	5	8	2	5	5	6	11	5	4	9	5	154	Sep 05 Monday
249	8	6	5	3	5	3	4	5	8	19	16	21	15	10	14	14	11	7	3	7	9	4	3	6	206	Sep 06 Tuesday
250	6	7	11	4	9	0	4	2	12	12	15	9	16	11	15	10	1	1	6	12	2	10	3	1	179	Sep 07 Wednesday
251	6	6	8	4	0	2	3	3	16	15	16	18	11	8	15	12	15	2	7	2	7	3	6	6	191	Sep 08 Thursday
252	5	9	11	6	4	5	0	0	4	0	11	22	15	10	5	8	10	5	11	14	14	15	9	10	203	Sep 09 Friday
253	7	12	4	8	13	11	11	13	5	11	7	9	1	5	6	3	7	6	3	2	2	5	2	2	155	Sep 10 Saturday
254	2	12	1	5	7	5	9	6	8	4	12	5	10	7	5	9	8	18	4	13	11	9	1	16	187	Sep 11 Sunday
255	4	9	6	7	4	5	8	3	8	14	12	17	17	19	8	3	9	1	9	3	6	5	20	7	204	Sep 12 Monday
256	9	4	12	6	10	5	16	5	13	9	15	15	18	12	12	14	2	8	5	11	7	7	6	10	231	Sep 13 Tuesday
257	7	15	14	12	1	9	3	8	9	19	5	22	17	14	15	16	3	2	4	3	4	6	2	6	216	Sep 14 Wednesday
258	7	9	8	4	1	4	5	7	6	7	14	17	11	8	3	13	8	7	6	20	16	7	10	8	206	Sep 15 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	11	5	10	7	8	3	8	2	15	13	12	10	17	14	17	17	0	0	0	0	0	0	0	0	169	Sep 16 Friday
260	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	7	7	9	6	3	3	6	4	2	55	Sep 17 Saturday
261	7	4	3	16	3	2	5	7	11	6	9	3	5	6	6	4	6	16	9	6	8	7	6	3	158	Sep 18 Sunday
262	4	6	4	6	2	1	3	7	2	9	0	9	9	5	11	12	3	4	4	8	8	8	7	9	141	Sep 19 Monday
263	9	7	4	2	3	4	4	2	11	7	16	16	9	7	8	13	6	3	6	11	7	10	7	9	181	Sep 20 Tuesday
264	5	8	12	5	1	7	3	4	6	2	15	20	18	12	12	8	5	2	8	9	5	8	6	7	188	Sep 21 Wednesday
265	6	4	10	3	4	7	7	6	7	11	13	14	9	12	8	11	5	5	4	10	6	11	3	10	186	Sep 22 Thursday
266	8	10	9	7	3	3	4	4	10	9	10	19	13	3	4	4	0	4	5	3	7	2	8	2	151	Sep 23 Friday
267	5	3	5	10	6	7	3	0	3	10	14	5	4	8	3	9	6	16	24	11	11	20	32	10	225	Sep 24 Saturday
268	2	6	11	12	16	9	9	4	6	11	18	8	4	3	0	2	5	4	13	6	13	6	13	11	192	Sep 25 Sunday
269	7	13	7	10	8	4	1	1	4	10	9	5	10	26	9	5	0	6	6	6	10	6	2	3	168	Sep 26 Monday
270	3	9	13	4	6	2	3	8	2	7	12	12	17	6	13	7	1	9	4	3	5	6	2	10	164	Sep 27 Tuesday
271	9	8	6	10	4	4	1	8	3	11	10	16	23	12	12	8	11	10	3	6	5	7	1	3	191	Sep 28 Wednesday
272	4	10	4	8	3	8	9	6	12	13	5	12	10	12	11	6	6	4	0	5	6	5	7	11	177	Sep 29 Thursday
273	7	5	12	9	2	1	1	6	0	10	15	6	15	15	7	4	3	4	4	6	5	10	4	10	161	Sep 30 Friday

FIN	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum		1921		1393		924		1481		1939		2552		1898		1605		1472		1684		1701		1599		
	1808		1927		1098		1238		1841		2317		2284		1698		1350		1662		1562		1648		40602	Total sum
180	10	11	11	8	6	5	7	8	10	11	13	14	13	11	9	9	8	8	9	9	9	9	9	9	226	Total average
126	11	11	12	8	5	5	6	8	11	12	15	17	14	11	10	10	8	8	9	9	8	9	9	9	234	Average workdays
54	8	10	9	8	8	6	8	9	8	8	9	8	8	9	8	7	6	9	9	9	9	9	9	8	199	Average weekends

Table 3.5.3. Daily and hourly distribution of FINESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	8	1	1	6	6	1	3	6	10	11	11	15	7	13	4	2	1	9	7	2	3	2	3	5	137	Apr 01 Friday
92	3	3	5	1	1	5	5	0	0	2	7	0	3	2	0	5	1	3	0	1	1	1	1	4	54	Apr 02 Saturday
93	3	2	2	1	5	2	2	4	3	8	2	5	7	9	1	5	0	3	5	1	0	0	6	1	77	Apr 03 Sunday
94	3	7	4	3	2	1	4	0	4	3	6	1	1	4	3	1	2	4	1	1	4	4	2	7	72	Apr 04 Monday
95	2	7	2	1	0	9	6	3	9	17	14	5	7	4	11	6	8	7	2	8	0	12	11	8	159	Apr 05 Tuesday
96	4	3	3	2	12	4	7	9	16	22	21	24	25	7	8	6	2	3	1	5	5	3	2	2	196	Apr 06 Wednesday
97	0	2	1	2	3	6	5	11	8	25	13	18	9	7	4	6	7	6	3	4	1	3	1	0	145	Apr 07 Thursday
98	1	12	3	6	3	5	3	5	15	15	6	18	5	5	3	1	4	4	4	3	8	1	6	2	138	Apr 08 Friday
99	2	6	3	4	3	8	8	11	3	8	5	8	9	5	4	6	0	2	2	1	1	6	1	8	114	Apr 09 Saturday
100	0	0	1	2	5	9	1	6	5	14	4	2	5	6	1	2	3	9	2	4	10	2	2	4	99	Apr 10 Sunday
101	7	3	6	1	0	1	3	7	12	17	5	15	2	6	2	4	6	0	10	3	2	1	2	0	115	Apr 11 Monday
102	2	3	2	2	1	2	3	14	19	27	29	17	5	10	7	7	0	3	6	1	4	1	3	0	168	Apr 12 Tuesday
103	13	1	5	6	10	0	4	7	10	10	21	21	16	5	8	5	7	2	2	2	5	5	14	7	186	Apr 13 Wednesday
104	0	7	3	7	3	1	3	11	13	15	23	21	13	14	9	9	4	2	11	1	12	0	1	4	187	Apr 14 Thursday
105	1	0	5	6	0	1	3	10	23	20	20	17	15	10	10	1	8	1	2	0	2	0	1	2	158	Apr 15 Friday
106	0	5	4	2	5	1	2	3	9	3	6	7	12	1	2	0	1	4	0	3	0	2	2	10	84	Apr 16 Saturday
107	1	1	1	0	5	3	5	0	9	6	9	8	6	7	1	1	3	3	1	1	8	2	2	4	87	Apr 17 Sunday
108	2	10	5	3	1	1	9	7	17	11	8	8	6	11	15	11	3	5	7	0	6	3	2	4	155	Apr 18 Monday
109	8	6	0	5	6	1	4	8	12	23	28	17	13	8	7	5	7	4	1	9	5	3	9	5	194	Apr 19 Tuesday
110	8	5	6	16	4	7	7	16	9	20	23	23	7	22	35	8	5	1	7	3	1	14	2	6	255	Apr 20 Wednesday
111	7	3	1	6	3	3	11	22	16	33	12	18	30	26	17	6	12	11	6	4	3	0	3	9	262	Apr 21 Thursday
112	4	4	4	12	2	3	6	10	11	14	15	25	10	2	4	11	4	2	1	4	8	0	3	4	163	Apr 22 Friday
113	3	1	1	3	3	1	0	1	5	8	6	7	3	11	0	9	0	0	5	4	5	4	0	2	82	Apr 23 Saturday
114	0	1	2	9	3	0	3	0	5	8	4	6	5	0	1	4	3	3	2	2	3	6	0	5	75	Apr 24 Sunday
115	7	1	2	3	1	6	6	10	14	17	6	20	5	5	11	4	3	6	9	9	2	2	3	0	152	Apr 25 Monday
116	4	6	9	6	1	0	3	11	8	21	15	10	16	9	15	5	8	6	8	3	1	0	1	7	173	Apr 26 Tuesday
117	3	7	5	5	5	0	8	12	18	18	20	12	9	4	16	1	9	5	0	0	5	0	2	2	166	Apr 27 Wednesday
118	1	7	2	2	2	12	11	11	10	21	20	23	13	8	29	10	7	9	7	1	1	3	2	3	215	Apr 28 Thursday
119	4	1	3	1	0	7	4	23	16	28	25	19	12	7	8	4	11	6	5	2	2	2	2	2	194	Apr 29 Friday
120	1	4	2	5	4	5	3	6	6	13	9	11	3	4	0	1	3	7	1	4	4	1	7	5	109	Apr 30 Saturday
121	5	5	3	1	14	0	3	1	3	2	3	3	4	4	2	3	0	1	0	0	6	5	4	0	72	May 01 Sunday
122	3	4	3	0	0	2	8	5	16	11	9	10	8	15	13	5	2	7	5	1	0	0	6	2	135	May 02 Monday
123	1	1	10	4	5	13	6	9	17	36	21	13	19	13	12	13	5	6	4	0	2	5	3	3	221	May 03 Tuesday
124	0	2	3	3	4	12	11	17	13	22	31	19	20	13	17	13	6	7	3	2	0	1	7	4	230	May 04 Wednesday
125	4	3	6	3	3	8	9	9	16	20	16	18	11	16	12	6	5	3	1	4	3	8	5	6	195	May 05 Thursday
126	8	3	0	5	5	3	7	16	8	28	19	29	19	4	11	0	7	1	4	3	5	8	5	10	208	May 06 Friday
127	3	8	5	2	3	1	6	5	8	6	6	3	17	7	6	4	2	3	2	1	3	3	3	3	110	May 07 Saturday
128	0	1	2	0	5	4	0	3	7	5	4	4	3	5	0	0	0	0	0	0	0	0	4	4	51	May 08 Sunday
129	4	1	5	12	4	6	7	11	21	21	23	16	14	8	8	7	11	4	3	4	1	7	6	6	210	May 09 Monday
130	5	6	11	2	10	7	23	21	30	40	19	13	15	13	8	13	3	3	5	2	6	2	1	1	259	May 10 Tuesday
131	5	9	1	3	4	3	8	10	20	24	13	20	8	5	9	11	7	2	7	4	6	10	6	1	196	May 11 Wednesday
132	5	8	0	5	2	1	2	3	16	14	51	5	0	0	0	0	7	8	13	8	11	14	6	19	198	May 12 Thursday
133	16	9	14	3	4	7	10	10	20	21	12	11	12	11	2	4	5	10	7	3	4	2	8	8	213	May 13 Friday
134	10	5	9	9	3	5	10	14	9	26	23	16	6	7	0	9	7	2	2	1	6	3	8	5	195	May 14 Saturday
135	5	7	2	3	5	5	4	3	12	24	8	5	9	5	15	2	3	1	5	1	2	2	4	5	137	May 15 Sunday
136	10	5	8	1	4	8	4	4	9	22	18	30	20	17	16	10	9	4	8	4	8	4	5	6	234	May 16 Monday
137	11	3	8	5	9	6	8	10	17	36	19	19	22	16	10	41	17	7	9	3	7	1	6	6	296	May 17 Tuesday
138	7	7	13	1	9	3	23	39	49	34	36	12	28	30	33	35	11	5	3	11	3	5	2	2	401	May 18 Wednesday
139	1	8	15	9	7	21	20	21	27	39	17	50	36	23	32	55	11	3	11	12	7	13	11	6	455	May 19 Thursday
140	14	8	9	3	11	32	30	41	60	26	8	37	4	8	2	3	7	9	4	1	3	4	5	2	331	May 20 Friday
141	3	4	3	6	10	22	18	14	8	13	14	18	9	8	1	4	2	6	3	2	3	1	7	7	186	May 21 Saturday
142	7	1	1	4	4	8	4	7	0	3	2	10	2	7	6	6	0	6	0	4	9	1	9	0	101	May 22 Sunday
143	2	5	2	1	2	5	13	10	8	19	14	50	24	29	7	6	2	3	2	5	4	7	2	2	224	May 23 Monday
144	4	3	16	9	33	27	20	13	27	28	18	49	23	39	21	19	20	3	7	7	6	8	4	19	423	May 24 Tuesday
145	4	8	3	4	5	11	28	22	24	22	30	17	15	13	12	13	27	6	6	7	5	9	12	9	312	May 25 Wednesday
146	10	2	3	29	15	8	15	25	25	35	28	11	7	16	21	17	7	10	6	15	14	9	10	8	346	May 26 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	4	9	12	12	10	18	16	16	13	16	32	20	14	7	0	1	10	0	2	7	2	2	4	9	236	May 27 Friday
148	2	3	6	4	7	8	6	12	6	6	11	16	23	10	2	2	3	1	2	7	1	2	4	2	146	May 28 Saturday
149	9	3	1	3	8	3	0	1	1	6	8	6	5	7	13	11	3	0	4	1	2	3	5	5	108	May 29 Sunday
150	6	4	8	3	10	34	15	15	22	19	20	18	15	9	19	31	20	0	7	6	3	4	4	5	297	May 30 Monday
151	3	5	4	8	5	11	6	10	32	23	14	26	25	26	41	42	8	5	13	8	7	3	6	8	339	May 31 Tuesday
152	4	0	0	0	0	0	0	0	0	0	12	21	23	14	17	19	10	9	1	3	6	7	3	5	154	Jun 01 Wednesday
153	3	5	7	5	4	1	6	6	8	19	22	24	16	6	1	6	6	10	8	5	9	3	7	18	205	Jun 02 Thursday
154	13	9	11	16	10	10	11	6	20	13	18	29	28	4	7	8	7	14	8	2	5	12	8	3	272	Jun 03 Friday
155	5	11	4	7	12	7	8	14	20	10	18	27	21	9	11	4	5	5	5	3	1	1	7	3	218	Jun 04 Saturday
156	3	9	5	4	4	5	5	16	14	19	14	9	0	8	10	18	11	2	4	5	9	4	9	6	193	Jun 05 Sunday
157	4	7	12	7	12	34	31	36	44	23	22	31	16	27	26	68	16	3	3	0	6	14	6	5	453	Jun 06 Monday
158	10	2	7	2	15	13	6	22	24	27	20	9	16	17	17	16	14	7	7	4	2	6	7	1	271	Jun 07 Tuesday
159	3	6	2	10	8	4	6	18	10	34	16	17	22	12	19	4	14	12	10	3	5	11	6	10	262	Jun 08 Wednesday
160	15	27	4	8	9	6	4	8	30	48	21	17	26	20	15	3	12	1	3	5	14	5	2	4	307	Jun 09 Thursday
161	4	14	5	6	9	10	7	9	10	9	14	31	13	8	5	7	5	5	2	16	8	9	9	4	219	Jun 10 Friday
162	5	4	3	0	9	4	5	6	5	9	13	8	8	6	11	6	8	5	2	5	3	7	1	5	138	Jun 11 Saturday
163	3	2	0	6	1	3	7	9	6	10	5	6	1	9	10	3	5	5	2	1	0	7	4	2	107	Jun 12 Sunday
164	5	3	10	7	3	6	15	27	35	52	40	28	12	22	27	15	16	6	5	7	4	7	8	6	366	Jun 13 Monday
165	5	7	7	6	3	8	16	14	31	11	34	30	8	18	23	15	11	6	2	13	9	7	5	1	290	Jun 14 Tuesday
166	2	4	7	0	8	5	14	11	23	25	36	16	10	18	15	16	15	5	4	5	1	0	2	5	247	Jun 15 Wednesday
167	1	4	11	5	5	4	17	11	15	30	24	33	25	35	14	18	13	1	47	23	59	4	0	0	399	Jun 16 Thursday
168	0	0	0	0	0	3	29	9	24	21	13	15	6	6	7	5	2	1	1	7	2	2	1	0	154	Jun 17 Friday
169	2	7	4	10	5	17	6	8	9	7	4	15	17	18	6	15	3	7	15	1	1	2	4	3	186	Jun 18 Saturday
170	3	1	1	0	2	5	1	5	6	10	15	16	4	8	9	6	0	2	0	5	7	3	6	7	122	Jun 19 Sunday
171	8	3	2	1	4	17	19	16	30	36	19	15	13	12	5	29	9	3	10	6	6	0	7	2	272	Jun 20 Monday
172	0	1	9	2	4	8	6	14	7	34	30	23	22	12	23	2	22	1	7	9	3	5	6	3	253	Jun 21 Tuesday
173	1	5	4	2	8	11	9	14	24	38	26	27	34	25	11	10	7	9	7	6	2	8	2	7	297	Jun 22 Wednesday
174	2	2	2	3	3	14	13	15	24	15	22	24	17	18	10	13	6	10	8	3	8	3	0	9	244	Jun 23 Thursday
175	1	3	10	3	4	18	10	31	22	38	61	41	28	13	15	4	4	3	0	10	3	4	2	5	333	Jun 24 Friday
176	0	2	2	2	4	17	15	20	21	18	19	21	14	15	5	6	0	7	3	1	0	1	0	10	203	Jun 25 Saturday
177	8	2	0	4	3	2	5	0	6	9	1	7	4	3	0	1	6	0	3	1	1	3	7	5	81	Jun 26 Sunday
178	5	7	11	3	9	45	43	49	51	36	34	48	22	18	34	70	13	11	5	1	1	1	6	5	528	Jun 27 Monday
179	2	1	5	8	23	23	26	49	29	32	27	25	37	19	17	35	57	15	13	12	1	0	1	2	459	Jun 28 Tuesday
180	0	3	9	2	8	44	37	18	21	26	13	33	22	14	20	40	78	25	6	1	49	4	6	3	482	Jun 29 Wednesday
181	7	0	4	1	11	26	32	20	14	45	43	51	31	50	87	47	55	7	8	4	2	2	2	7	556	Jun 30 Thursday
182	0	5	13	1	20	26	66	97	69	53	49	31	18	23	12	17	4	2	2	7	3	2	4	4	528	Jul 01 Friday
183	5	1	4	22	30	58	25	34	37	32	44	41	30	22	23	1	0	0	9	0	4	5	4	3	434	Jul 02 Saturday
184	2	1	4	6	3	1	1	4	3	8	3	4	1	6	3	10	3	2	3	3	1	3	11	0	86	Jul 03 Sunday
185	3	4	1	2	6	7	14	17	18	22	11	15	18	13	15	40	11	2	2	1	0	49	20	10	301	Jul 04 Monday
186	16	2	3	6	11	5	9	25	12	26	28	31	22	20	16	28	126	109	26	0	0	0	0	0	521	Jul 05 Tuesday
187	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 06 Wednesday
188	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 07 Thursday
189	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 08 Friday
190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 09 Saturday
191	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul 10 Sunday
192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	10	4	2	5	2	12	5	1	57	Jul 11 Monday
193	2	7	9	0	11	11	15	18	24	17	24	27	38	31	21	31	6	2	1	6	2	3	3	1	310	Jul 12 Tuesday
194	4	0	12	17	9	12	8	10	24	11	0	0	10	10	27	12	14	4	5	7	2	0	4	1	203	Jul 13 Wednesday
195	4	3	9	2	14	7	6	10	24	17	14	15	10	16	15	25	18	7	21	3	2	5	1	3	251	Jul 14 Thursday
196	0	2	3	4	2	11	12	5	22	13	32	15	13	14	10	1	7	0	7	1	3	3	7	6	193	Jul 15 Friday
197	0	1	6	6	2	5	3	9	9	11	57	35	12	12	10	24	28	1	9	5	1	6	6	0	258	Jul 16 Saturday
198	1	3	1	2	2	1	4	5	14	8	15	9	2	1	1	15	1	6	2	3	4	1	9	9	119	Jul 17 Sunday
199	7	11	16	5	3	11	18	18	38	24	30	23	30	13	35	31	16	5	38	99	2	2	6	4	485	Jul 18 Monday
200	6	6	8	4	3	7	10	18	15	29	22	22	17	9	14	7	19	10	11	10	2	4	8	0	261	Jul 19 Tuesday
201	2	6	10	3	13	7	11	11	8	46	19	44	78	65	71	58	3	11	14	0	10	4	3	4	501	Jul 20 Wednesday
202	1	7	3	3	9	11	16	18	24	27	17	28	15	24	14	8	11	13	21	9	8	7	5	4	303	Jul 21 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	12	5	6	12	6	4	10	25	24	15	35	12	15	15	10	20	10	7	2	6	4	0	11	7	273	Jul 22 Friday
204	3	0	4	7	8	13	3	23	29	14	9	24	15	25	12	7	5	2	4	1	8	2	2	2	222	Jul 23 Saturday
205	7	0	0	0	0	3	2	3	4	11	5	3	1	2	13	7	2	2	7	0	8	5	11	14	110	Jul 24 Sunday
206	11	4	10	5	12	30	14	20	9	19	20	19	17	10	22	27	22	14	5	3	6	5	13	7	324	Jul 25 Monday
207	4	6	6	7	2	10	17	15	11	32	27	25	15	44	36	16	2	5	5	2	4	1	4	4	300	Jul 26 Tuesday
208	5	3	13	5	3	10	10	23	18	30	21	26	10	10	10	8	9	2	2	5	6	0	1	3	233	Jul 27 Wednesday
209	3	16	1	1	7	10	11	16	16	32	13	20	16	13	9	14	8	2	5	4	1	5	2	4	229	Jul 28 Thursday
210	7	10	6	3	3	2	4	14	18	25	18	17	15	18	10	6	8	2	8	6	2	4	6	8	220	Jul 29 Friday
211	7	5	3	4	6	7	7	3	5	10	6	1	6	2	15	5	0	1	1	4	2	4	7	3	114	Jul 30 Saturday
212	2	1	1	7	4	11	1	4	4	6	3	2	8	2	1	7	2	3	2	13	3	3	8	4	102	Jul 31 Sunday
213	11	6	9	3	8	8	11	4	8	24	15	13	10	12	18	17	8	7	2	3	1	3	4	3	208	Aug 01 Monday
214	93	58	8	5	9	46	21	11	19	20	21	19	9	9	26	27	5	3	4	5	3	2	2	5	430	Aug 02 Tuesday
215	5	8	5	15	2	7	12	20	21	16	22	21	12	18	16	28	21	19	11	9	4	3	3	13	311	Aug 03 Wednesday
216	4	6	11	5	5	3	8	13	16	26	26	16	14	18	22	21	5	11	13	2	5	7	11	6	274	Aug 04 Thursday
217	0	6	10	5	15	4	1	11	29	31	19	22	16	17	7	10	8	6	5	7	5	3	4	1	242	Aug 05 Friday
218	2	5	7	4	2	8	9	16	13	9	6	9	4	5	4	4	3	3	8	4	0	5	1	0	131	Aug 06 Saturday
219	3	1	3	16	7	20	8	11	9	10	3	2	4	15	132	17	1	4	3	2	3	8	6	4	292	Aug 07 Sunday
220	7	6	5	7	1	7	7	3	10	20	20	5	7	8	19	10	8	5	6	5	2	10	0	1	179	Aug 08 Monday
221	4	5	5	8	14	3	14	14	28	21	21	26	23	21	26	28	33	17	4	4	9	5	3	12	348	Aug 09 Tuesday
222	1	6	11	0	4	13	1	10	24	10	15	16	10	6	12	11	4	12	4	10	52	3	13	1	249	Aug 10 Wednesday
223	4	11	2	5	14	10	9	7	15	15	20	9	17	16	11	3	6	1	2	13	0	12	7	9	218	Aug 11 Thursday
224	4	7	9	11	16	2	16	6	0	0	11	27	10	5	18	19	6	5	5	5	3	4	4	0	193	Aug 12 Friday
225	2	1	1	9	2	0	4	1	7	12	11	3	3	5	7	22	7	6	5	1	3	3	4	2	121	Aug 13 Saturday
226	5	7	3	1	5	3	8	5	0	5	4	1	3	0	6	2	8	1	4	1	2	1	1	3	79	Aug 14 Sunday
227	3	1	3	0	3	4	7	5	22	17	18	19	5	6	16	3	6	2	2	4	3	3	1	3	156	Aug 15 Monday
228	5	3	5	8	9	4	12	10	16	22	27	18	17	23	21	11	6	8	1	8	1	2	11	2	250	Aug 16 Tuesday
229	4	8	5	4	3	4	11	6	19	17	26	16	15	24	3	5	6	5	3	5	3	2	8	1	203	Aug 17 Wednesday
230	5	11	5	8	17	25	17	22	10	23	19	17	20	17	8	5	4	6	10	7	0	5	3	0	264	Aug 18 Thursday
231	2	2	5	6	3	17	14	19	24	27	24	30	18	9	6	4	1	3	10	6	2	6	1	3	242	Aug 19 Friday
232	6	11	3	6	9	2	16	8	27	25	28	29	27	24	6	6	3	3	7	4	3	5	1	4	263	Aug 20 Saturday
233	1	2	6	6	8	6	2	10	9	17	8	5	16	9	6	11	6	1	1	2	4	6	5	13	160	Aug 21 Sunday
234	4	6	10	13	7	16	12	14	11	21	18	16	20	16	12	49	74	56	21	4	6	6	3	2	417	Aug 22 Monday
235	3	7	4	0	4	1	9	17	25	28	32	21	10	12	19	24	7	4	7	0	1	1	1	2	239	Aug 23 Tuesday
236	1	3	5	1	4	8	49	23	64	29	26	12	17	16	17	10	6	8	3	3	6	8	9	1	329	Aug 24 Wednesday
237	2	8	8	5	2	5	14	9	34	17	26	8	13	3	34	16	11	8	6	7	2	5	0	5	248	Aug 25 Thursday
238	10	6	5	2	0	10	6	11	15	23	24	29	13	12	5	11	8	4	2	4	2	1	8	2	213	Aug 26 Friday
239	0	3	2	9	0	11	4	3	1	18	10	9	11	9	2	5	7	3	4	10	2	3	0	1	127	Aug 27 Saturday
240	0	10	3	1	8	5	14	3	25	11	8	7	12	10	10	14	2	2	7	7	7	15	8	5	194	Aug 28 Sunday
241	19	18	14	9	3	6	14	9	12	23	17	26	14	10	13	12	9	7	4	1	0	4	1	4	249	Aug 29 Monday
242	4	4	4	9	4	6	27	18	7	22	23	16	15	11	10	8	8	4	5	8	6	6	9	1	235	Aug 30 Tuesday
243	1	8	5	5	7	4	19	24	56	34	48	34	22	30	10	19	5	2	8	6	46	3	7	9	412	Aug 31 Wednesday
244	113	16	43	25	2	19	37	18	16	25	23	18	32	33	38	27	32	12	1	11	7	4	3	3	558	Sep 01 Thursday
245	5	3	5	3	6	8	22	28	30	22	29	29	15	21	15	19	18	44	28	10	2	3	3	8	376	Sep 02 Friday
246	1	4	1	7	2	3	28	22	29	29	37	44	21	21	36	51	22	15	9	16	2	2	1	3	406	Sep 03 Saturday
247	0	0	5	3	9	3	14	9	10	8	18	12	9	13	13	15	9	1	3	4	4	4	4	4	174	Sep 04 Sunday
248	10	2	12	11	7	17	16	17	9	28	13	15	12	16	13	25	3	7	5	6	12	1	6	4	267	Sep 05 Monday
249	5	6	5	12	6	12	15	21	19	18	18	15	18	22	21	9	10	11	5	3	3	1	0	3	258	Sep 06 Tuesday
250	11	5	2	11	11	6	5	7	12	26	21	26	20	19	29	21	10	8	3	13	10	2	5	2	285	Sep 07 Wednesday
251	4	1	12	17	4	10	15	11	37	38	50	42	32	36	44	50	47	25	24	1	0	4	2	4	510	Sep 08 Thursday
252	4	7	1	4	2	3	6	12	17	22	19	19	13	8	11	19	9	5	5	1	4	2	1	2	196	Sep 09 Friday
253	4	7	9	5	9	12	10	3	18	16	7	22	6	14	5	11	8	5	5	3	1	0	1	0	181	Sep 10 Saturday
254	0	8	1	1	6	6	4	8	10	7	5	6	23	27	10	3	4	1	1	5	6	1	1	10	154	Sep 11 Sunday
255	7	5	6	3	3	3	8	9	6	17	14	23	28	13	55	41	7	5	3	13	1	3	2	15	290	Sep 12 Monday
256	3	6	12	13	17	15	22	33	18	25	22	32	20	25	26	17	9	12	2	5	10	2	6	3	355	Sep 13 Tuesday
257	1	1	11	10	8	16	9	20	23	33	28	19	20	24	19	15	4	4	1	1	4	4	0	1	276	Sep 14 Wednesday
258	2	4	2	0	5	8	5	14	16	27	22	25	12	8	11	49	10	1	7	2	5	2	4	4	245	Sep 15 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	3	1	6	4	7	7	18	7	17	24	21	19	21	5	10	16	7	7	1	3	1	1	0	5	211	Sep 16 Friday
260	7	0	11	6	5	2	2	8	4	12	14	16	10	5	4	2	5	6	2	1	1	2	10	3	138	Sep 17 Saturday
261	0	7	0	0	0	1	2	14	10	10	10	9	12	13	8	6	4	3	4	0	1	4	4	2	124	Sep 18 Sunday
262	4	6	7	2	0	12	9	9	7	17	26	24	7	11	15	8	4	5	3	5	5	1	5	7	199	Sep 19 Monday
263	8	10	8	4	3	7	4	11	17	16	21	24	20	31	24	15	4	5	5	12	4	5	5	1	264	Sep 20 Tuesday
264	5	5	6	6	3	10	7	22	21	18	15	31	17	15	8	18	12	5	3	3	6	3	1	4	244	Sep 21 Wednesday
265	5	4	8	7	12	5	4	16	11	23	13	24	18	14	17	16	7	0	10	3	2	1	1	2	223	Sep 22 Thursday
266	3	9	7	3	3	1	9	16	18	17	31	29	11	7	5	8	5	5	2	3	0	2	1	2	197	Sep 23 Friday
267	1	5	2	6	9	1	11	8	5	17	8	11	8	8	7	3	7	7	2	4	5	4	1	5	145	Sep 24 Saturday
268	3	2	0	6	1	2	2	10	2	5	13	8	8	13	6	9	18	4	0	2	1	8	5	4	132	Sep 25 Sunday
269	7	5	3	10	5	6	3	5	12	15	20	18	19	21	16	8	13	9	6	5	6	5	0	2	219	Sep 26 Monday
270	6	2	5	3	5	0	7	9	8	27	26	16	33	9	10	10	12	6	8	3	3	6	5	9	228	Sep 27 Tuesday
271	1	4	6	10	7	4	6	2	16	16	23	23	29	16	9	5	14	13	6	1	9	13	1	2	236	Sep 28 Wednesday
272	1	1	6	10	1	5	6	4	12	25	28	21	17	11	8	17	17	4	5	3	4	3	3	3	215	Sep 29 Thursday
273	6	8	3	9	8	2	11	15	18	24	27	21	19	10	12	6	20	3	6	7	3	1	9	4	252	Sep 30 Friday
GER	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	966	928	986	954	1075	1536	1888	2306	2955	3558	3349	3317	2614	2403	2525	2442	1785	1143	1030	905	885	759	801	795	41905	Total sum
178	5	5	6	5	6	9	11	13	17	20	19	19	15	14	14	14	10	6	6	5	5	4	5	4	235	Total average
123	6	6	7	6	6	10	12	15	20	24	22	22	17	15	17	16	12	8	7	6	6	4	5	4	271	Average workdays
55	3	4	3	5	5	6	6	8	10	12	12	12	9	9	9	8	5	4	4	3	3	4	4	5	151	Average weekends

Table 3.5.4. Daily and hourly distribution of GERESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	11	2	17	12	10	20	11	19	11	17	8	8	15	14	9	8	4	9	6	5	4	0	4	2	226	Apr 01 Friday
92	0	8	1	2	4	9	13	12	21	34	61	39	22	50	61	23	21	21	10	17	15	8	5	3	460	Apr 02 Saturday
93	0	2	1	6	4	5	7	10	13	4	12	2	6	6	11	8	10	11	6	1	9	3	10	8	155	Apr 03 Sunday
94	2	10	20	13	20	34	18	35	33	33	28	41	35	27	19	22	28	20	18	1	3	1	4	10	475	Apr 04 Monday
95	8	10	35	27	58	67	64	48	53	45	30	42	50	47	53	24	20	19	12	12	7	1	6	2	740	Apr 05 Tuesday
96	17	7	17	31	20	95	65	63	49	46	36	65	46	44	47	43	15	26	32	23	45	30	23	19	904	Apr 06 Wednesday
97	18	21	46	48	62	102	79	64	69	47	50	64	47	58	49	43	32	26	13	11	16	2	7	9	983	Apr 07 Thursday
98	18	20	38	36	59	83	76	62	66	61	63	83	56	58	43	26	30	18	25	14	4	12	5	5	961	Apr 08 Friday
99	6	12	7	15	13	41	29	15	26	20	18	22	24	15	17	3	14	19	6	4	7	5	9	1	348	Apr 09 Saturday
100	1	8	18	8	16	17	17	19	12	11	15	21	22	17	19	15	15	22	31	6	5	3	5	13	336	Apr 10 Sunday
101	3	16	32	44	48	89	86	44	46	44	70	52	61	53	68	34	22	39	16	8	17	15	12	7	926	Apr 11 Monday
102	10	16	29	46	61	91	101	81	100	71	91	64	70	57	36	42	29	25	17	6	20	3	9	1	1076	Apr 12 Tuesday
103	7	17	48	44	46	83	75	63	88	76	63	56	76	56	52	39	43	31	23	7	12	10	16	2	1033	Apr 13 Wednesday
104	10	11	40	56	72	87	69	63	64	70	68	86	84	50	52	33	38	41	33	23	21	21	15	22	1129	Apr 14 Thursday
105	27	23	38	51	62	85	77	64	70	77	64	73	74	52	54	25	28	26	30	24	11	7	6	7	1055	Apr 15 Friday
106	8	16	15	23	25	26	44	6	18	29	36	44	30	28	20	21	25	17	12	12	10	4	7	19	495	Apr 16 Saturday
107	5	14	21	4	26	37	23	14	29	11	10	24	34	25	20	15	9	28	12	3	12	9	12	6	403	Apr 17 Sunday
108	7	6	38	72	43	61	44	26	35	17	31	37	56	43	52	38	28	27	12	10	5	13	5	17	723	Apr 18 Monday
109	48	13	28	46	74	101	69	47	54	49	73	57	70	103	112	99	105	107	114	114	122	144	112	114	1975	Apr 19 Tuesday
110	124	153	145	102	117	112	112	88	68	73	94	81	81	57	40	22	24	26	34	18	21	18	33	40	1683	Apr 20 Wednesday
111	28	41	40	40	75	62	47	58	38	34	44	46	48	51	37	47	44	48	19	13	22	21	23	16	942	Apr 21 Thursday
112	3	13	32	27	33	56	66	41	40	45	46	43	56	35	39	35	58	27	15	13	23	5	4	3	758	Apr 22 Friday
113	3	7	6	16	15	22	28	19	21	14	36	28	49	25	29	19	12	19	9	5	5	8	1	1	397	Apr 23 Saturday
114	8	16	14	17	13	15	18	17	12	8	15	15	12	25	19	10	13	10	39	5	2	5	7	30	345	Apr 24 Sunday
115	53	37	54	64	80	98	83	80	85	106	105	90	97	85	30	31	18	26	5	15	18	1	4	0	1265	Apr 25 Monday
116	5	18	38	54	69	78	82	77	75	44	55	43	61	67	34	36	19	30	32	16	14	1	6	12	966	Apr 26 Tuesday
117	5	19	46	45	64	90	95	67	86	72	78	75	80	37	73	49	28	21	19	15	21	6	14	16	1121	Apr 27 Wednesday
118	16	17	47	64	65	118	110	87	65	64	76	84	62	61	50	37	71	25	36	18	8	5	5	4	1195	Apr 28 Thursday
119	27	19	27	72	57	82	83	96	69	81	65	86	63	59	32	28	46	22	15	10	20	15	5	6	1085	Apr 29 Friday
120	10	17	12	28	35	42	38	38	33	29	57	36	27	32	50	5	19	24	10	14	13	11	20	7	607	Apr 30 Saturday
121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	11	6	11	20	5	26	36	19	146	May 01 Sunday
122	11	14	11	12	18	26	30	46	29	38	49	35	16	20	21	9	6	21	2	7	1	5	9	1	437	May 02 Monday
123	1	3	7	18	23	15	23	19	31	9	12	8	24	17	19	4	14	13	3	14	0	10	14	1	302	May 03 Tuesday
124	7	20	20	28	39	43	52	54	59	38	56	37	47	46	31	26	45	33	17	5	4	10	7	0	724	May 04 Wednesday
125	7	11	21	51	61	89	68	55	45	53	80	72	50	42	52	44	30	19	20	2	13	26	7	8	926	May 05 Thursday
126	5	17	36	48	63	58	69	77	48	68	54	44	49	36	62	49	30	33	15	14	12	1	2	2	892	May 06 Friday
127	8	6	9	32	14	22	30	10	27	27	37	25	27	37	38	9	16	20	11	11	5	5	12	2	440	May 07 Saturday
128	7	8	0	21	23	11	15	7	23	27	27	15	17	23	30	11	14	24	7	14	2	3	2	13	344	May 08 Sunday
129	8	13	14	13	27	20	22	22	21	16	13	20	26	23	21	21	13	15	4	7	23	6	4	15	387	May 09 Monday
130	9	17	44	49	59	66	89	70	65	49	46	60	42	56	33	25	14	30	15	14	9	8	4	4	877	May 10 Tuesday
131	15	31	56	50	79	84	98	81	85	38	75	56	56	42	49	39	92	78	138	72	88	83	74	93	1652	May 11 Wednesday
132	65	85	90	94	138	150	86	85	76	86	109	101	68	57	61	52	45	38	13	11	7	10	5	17	1549	May 12 Thursday
133	12	26	47	59	81	98	90	91	60	79	86	87	85	60	58	50	31	20	8	12	19	17	14	5	1195	May 13 Friday
134	7	8	6	31	29	23	16	21	19	43	30	24	41	25	29	16	22	14	4	7	23	15	13	12	478	May 14 Saturday
135	19	18	24	20	17	7	12	9	12	10	6	13	10	29	20	3	12	7	0	2	6	10	5	6	277	May 15 Sunday
136	17	17	25	58	78	98	70	83	69	60	71	51	75	75	56	16	24	21	14	3	5	1	6	6	999	May 16 Monday
137	13	16	42	52	93	101	92	111	64	72	100	75	64	56	61	28	32	29	19	23	10	11	4	2	1170	May 17 Tuesday
138	15	11	27	44	71	89	101	78	66	64	67	65	71	75	62	35	30	30	20	5	18	8	14	2	1068	May 18 Wednesday
139	14	11	44	66	54	89	109	57	87	68	88	65	82	59	69	45	34	25	6	5	19	15	5	8	1124	May 19 Thursday
140	24	23	46	73	78	85	79	100	40	63	84	81	97	63	49	31	33	36	7	9	19	7	15	16	1158	May 20 Friday
141	13	13	13	17	24	24	22	16	16	19	18	20	39	32	22	13	24	19	6	5	6	5	0	11	397	May 21 Saturday
142	10	14	5	15	15	18	14	14	10	17	30	44	37	25	26	11	25	15	20	27	40	46	44	64	586	May 22 Sunday
143	87	71	134	165	129	165	139	136	138	114	117	106	106	100	92	69	64	54	54	61	37	32	29	48	2247	May 23 Monday
144	63	72	95	89	87	112	121	184	133	104	77	111	100	74	68	43	45	23	21	16	8	10	6	7	1669	May 24 Tuesday
145	21	24	31	66	83	95	108	86	77	72	70	93	75	71	53	39	39	30	24	15	4	6	15	11	1208	May 25 Wednesday
146	16	20	27	89	71	97	108	81	100	67	72	99	96	76	66	47	33	41	15	27	25	13	5	5	1296	May 26 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date	
147	21	18	36	76	83	82	125	81	103	80	108	136	127	125	105	63	64	43	36	33	25	21	46	26	1663	May 27	Friday
148	34	35	24	54	46	58	62	74	35	41	85	37	57	22	43	20	21	14	16	10	8	10	4	9	819	May 28	Saturday
149	6	7	4	35	7	27	26	13	13	4	4	18	27	23	25	8	11	12	13	2	17	1	5	1	309	May 29	Sunday
150	6	12	30	51	55	101	96	96	88	85	110	83	68	83	46	31	32	21	18	4	15	3	3	0	1137	May 30	Monday
151	3	15	51	53	64	126	88	101	108	92	97	101	78	76	60	54	37	27	24	21	13	5	3	19	1316	May 31	Tuesday
152	15	12	24	60	71	109	107	98	58	73	88	57	65	49	48	37	18	23	12	10	7	10	13	2	1066	Jun 01	Wednesday
153	6	18	33	81	62	90	108	57	56	73	57	71	82	89	72	49	46	37	25	20	21	9	13	12	1187	Jun 02	Thursday
154	9	13	48	49	64	94	94	88	78	63	73	86	84	37	55	32	69	36	20	6	10	10	11	5	1134	Jun 03	Friday
155	10	30	17	21	12	14	33	36	19	6	20	32	13	20	30	14	22	9	5	23	24	33	26	17	486	Jun 04	Saturday
156	16	23	29	56	59	59	62	61	73	50	43	50	69	42	30	19	38	49	41	34	27	17	12	9	968	Jun 05	Sunday
157	16	13	17	53	74	113	89	103	67	92	53	79	69	50	39	34	22	32	17	21	11	11	10	4	1089	Jun 06	Monday
158	1	12	41	47	85	101	81	98	76	67	92	57	84	83	50	36	50	27	16	23	27	1	13	6	1174	Jun 07	Tuesday
159	14	9	51	76	75	88	88	82	82	100	95	91	85	89	65	44	50	35	34	52	38	40	32	32	1447	Jun 08	Wednesday
160	84	64	84	79	96	123	121	144	138	86	88	57	80	60	53	41	46	36	22	5	22	12	9	8	1558	Jun 09	Thursday
161	17	18	39	55	57	85	88	67	69	72	53	142	61	67	49	119	99	116	97	110	108	86	40	67	1781	Jun 10	Friday
162	50	44	39	62	38	31	33	27	40	36	15	31	21	13	39	22	36	38	6	0	9	1	11	3	645	Jun 11	Saturday
163	4	11	13	9	22	21	37	19	21	10	8	7	9	35	14	27	17	12	26	7	1	1	2	4	337	Jun 12	Sunday
164	5	5	0	16	35	18	56	23	13	16	27	15	18	46	26	26	21	9	8	2	13	0	7	4	409	Jun 13	Monday
165	0	22	47	50	54	105	119	64	87	78	76	75	98	56	47	31	35	19	13	15	2	10	11	0	1114	Jun 14	Tuesday
166	3	18	43	54	74	123	111	97	109	109	77	85	98	63	59	36	27	67	17	14	11	15	7	10	1327	Jun 15	Wednesday
167	18	27	48	64	78	105	91	113	90	92	67	76	69	81	61	41	26	28	16	13	10	15	9	28	1266	Jun 16	Thursday
168	21	70	63	101	97	103	123	97	118	97	98	105	143	110	72	83	39	38	26	11	31	16	21	31	1714	Jun 17	Friday
169	25	31	44	73	55	53	48	31	41	29	44	16	36	16	29	18	19	17	5	16	31	3	14	3	697	Jun 18	Saturday
170	9	15	2	20	23	19	18	15	8	14	31	31	30	29	20	17	12	3	1	19	18	8	5	11	378	Jun 19	Sunday
171	14	4	20	51	77	106	114	79	88	78	74	51	51	61	45	36	28	14	1	17	10	23	13	1	1056	Jun 20	Monday
172	7	27	53	70	87	118	104	93	106	89	94	73	79	63	50	41	19	34	8	11	12	4	18	17	1277	Jun 21	Tuesday
173	17	19	46	71	78	117	101	92	106	81	81	86	83	63	50	23	38	23	20	20	10	0	3	0	1228	Jun 22	Wednesday
174	3	20	65	85	60	89	91	106	67	99	65	81	110	66	32	44	27	23	32	5	5	52	16	10	1253	Jun 23	Thursday
175	21	21	63	83	94	79	84	95	85	106	128	111	93	63	44	34	66	49	29	26	19	7	10	34	1444	Jun 24	Friday
176	43	35	21	33	42	35	25	95	32	25	29	39	55	29	34	17	11	8	2	5	15	14	0	7	651	Jun 25	Saturday
177	15	7	6	19	8	22	27	29	21	41	21	24	23	19	26	14	29	12	8	18	2	4	6	1	402	Jun 26	Sunday
178	6	14	39	54	49	109	122	88	74	57	108	133	177	108	33	29	19	19	18	22	11	7	8	30	1334	Jun 27	Monday
179	38	87	53	56	84	85	96	198	374	217	103	72	86	81	47	37	29	35	18	14	12	7	5	9	1843	Jun 28	Tuesday
180	17	21	40	71	70	136	120	91	102	101	62	82	101	58	54	29	68	26	14	7	14	6	5	2	1297	Jun 29	Wednesday
181	20	18	42	59	66	106	107	61	85	76	105	77	69	73	50	25	39	24	4	11	29	15	16	4	1181	Jun 30	Thursday
182	17	49	49	52	79	82	106	65	75	93	99	99	46	57	51	43	56	25	20	40	24	26	35	27	1315	Jul 01	Friday
183	30	27	20	36	45	53	51	28	23	32	39	34	29	25	15	4	20	12	14	8	15	17	15	8	600	Jul 02	Saturday
184	0	15	12	26	21	27	29	24	15	16	31	39	30	24	15	9	25	15	7	1	3	9	11	10	414	Jul 03	Sunday
185	4	9	17	58	61	95	110	101	73	9	0	0	0	0	0	0	0	0	0	0	0	0	0	5	542	Jul 04	Monday
186	8	29	45	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	28	5	22	16	192	Jul 05	Tuesday
187	3	25	49	67	83	74	89	107	97	80	127	90	134	131	136	120	126	106	75	53	54	51	25	24	1926	Jul 06	Wednesday
188	13	18	36	69	81	109	122	81	86	84	111	68	64	90	66	40	31	42	20	13	17	7	6	14	1288	Jul 07	Thursday
189	4	19	30	55	78	93	109	86	88	91	38	82	82	73	36	29	33	17	14	28	32	5	10	23	1155	Jul 08	Friday
190	6	13	23	23	23	37	24	23	51	49	15	24	32	23	27	25	28	34	8	27	14	8	8	15	560	Jul 09	Saturday
191	0	12	4	21	22	18	23	13	26	9	17	6	28	22	16	14	11	13	3	1	7	2	8	3	299	Jul 10	Sunday
192	4	17	26	63	62	100	102	79	112	59	93	64	104	50	49	10	37	10	9	12	2	12	7	4	1087	Jul 11	Monday
193	8	24	39	77	86	114	106	65	91	83	87	76	86	76	37	23	26	27	24	16	17	2	7	12	1209	Jul 12	Tuesday
194	27	13	57	69	73	0	98	87	74	93	65	71	83	67	39	28	29	29	15	19	5	7	10	5	1063	Jul 13	Wednesday
195	7	11	30	63	64	108	104	132	72	65	77	72	79	66	50	43	43	37	19	25	26	23	1	7	1224	Jul 14	Thursday
196	11	18	50	48	74	92	69	84	90	67	74	94	68	73	45	31	23	31	31	28	12	23	9	14	1159	Jul 15	Friday
197	8	15	1	19	41	24	33	25	20	28	15	44	50	30	27	22	22	28	4	7	15	12	6	3	499	Jul 16	Saturday
198	7	12	10	17	18	4	15	2	18	13	21	22	39	12	18	11	12	22	22	28	41	49	38	49	500	Jul 17	Sunday
199	37	38	74	78	86	102	129	65	97	57	79	79	70	65	61	41	67	22	28	20	24	19	16	20	1374	Jul 18	Monday
200	40	30	43	60	60	102	97	93	79	74	84	80	79	83	40	24	18	18	10	17	24	21	3	7	1186	Jul 19	Tuesday
201	10	10	45	64	79	101	107	79	90	70	126	103	90	73	54	37	40	25	4	15	8	13	17	10	1270	Jul 20	Wednesday
202	4	20	52	78	73	108	91	86	91	66	77	96	66	85	55	40	42	23	29	24	23	5	6	1	1241	Jul 21	Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	19	25	41	67	78	89	87	57	55	56	77	119	79	56	45	47	35	18	29	13	7	11	4	15	1129	Jul 22 Friday
204	17	19	3	26	24	30	69	26	29	18	35	29	31	23	49	20	21	19	19	19	9	14	18	9	576	Jul 23 Saturday
205	4	9	8	23	35	35	27	18	15	14	23	51	17	19	31	27	18	17	20	2	13	10	5	10	451	Jul 24 Sunday
206	16	17	27	65	67	90	83	80	70	73	101	63	63	59	40	20	21	32	15	16	20	11	28	5	1082	Jul 25 Monday
207	5	14	39	81	79	90	88	69	60	53	72	88	114	94	66	40	28	35	31	23	13	31	11	11	1235	Jul 26 Tuesday
208	1	23	37	58	83	87	95	91	71	77	66	84	82	79	64	45	48	31	23	12	9	6	11	13	1196	Jul 27 Wednesday
209	23	33	32	66	90	72	70	67	45	69	76	63	65	64	39	30	28	26	26	41	57	8	13	17	1120	Jul 28 Thursday
210	17	29	40	68	52	112	89	93	105	107	132	135	117	94	60	64	46	40	28	23	9	17	10	17	1504	Jul 29 Friday
211	14	16	25	27	30	21	38	24	25	42	32	42	43	26	46	9	9	19	8	2	5	10	5	7	525	Jul 30 Saturday
212	1	1	5	9	22	57	30	15	16	13	14	10	21	28	20	20	15	6	11	4	1	8	0	14	341	Jul 31 Sunday
213	4	10	18	57	49	85	89	44	94	87	78	82	64	48	38	24	18	13	16	10	1	19	1	3	952	Aug 01 Monday
214	11	21	20	51	69	95	86	82	76	69	61	69	67	45	51	85	61	47	33	16	18	16	9	7	1165	Aug 02 Tuesday
215	10	6	35	54	66	99	91	88	89	76	70	87	74	71	37	49	29	23	8	6	12	9	18	8	1115	Aug 03 Wednesday
216	15	22	89	87	107	143	123	116	101	125	106	89	101	81	63	25	44	32	9	21	18	17	17	6	1557	Aug 04 Thursday
217	8	39	47	72	89	98	90	102	90	90	84	90	80	37	63	49	36	27	22	10	11	10	18	8	1270	Aug 05 Friday
218	3	16	10	25	20	23	46	38	30	47	28	35	24	28	51	28	36	39	7	7	18	23	15	22	619	Aug 06 Saturday
219	23	11	13	13	17	14	12	9	24	27	19	24	24	16	25	17	30	23	17	11	20	15	14	17	435	Aug 07 Sunday
220	14	13	7	11	14	18	24	24	20	26	21	28	21	21	18	33	26	16	19	17	19	22	17	27	476	Aug 08 Monday
221	10	7	15	13	11	17	9	18	24	18	20	31	43	31	54	44	20	9	12	17	18	10	15	14	480	Aug 09 Tuesday
222	11	11	10	15	20	15	21	21	16	15	13	28	22	19	26	103	70	27	7	4	2	3	0	3	482	Aug 10 Wednesday
223	3	5	1	2	5	6	6	55	36	6	12	4	1	6	4	4	6	95	21	12	6	11	8	2	317	Aug 11 Thursday
224	3	13	4	10	5	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	Aug 12 Friday
225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 13 Saturday
226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 14 Sunday
227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 15 Monday
228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 16 Tuesday
229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 17 Wednesday
230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 18 Thursday
231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 19 Friday
232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 20 Saturday
233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 21 Sunday
234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 22 Monday
235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 23 Tuesday
236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 24 Wednesday
237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 25 Thursday
238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 26 Friday
239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 27 Saturday
240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 28 Sunday
241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 29 Monday
242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 30 Tuesday
243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 31 Wednesday
244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 01 Thursday
245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 02 Friday
246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 03 Saturday
247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 04 Sunday
248	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 05 Monday
249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 06 Tuesday
250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 07 Wednesday
251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 08 Thursday
252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 09 Friday
253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 10 Saturday
254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 11 Sunday
255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 12 Monday
256	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 13 Tuesday
257	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 14 Wednesday
258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 15 Thursday

Table 3.5.5 (Page 3 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 16 Friday
260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 17 Saturday
261	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 18 Sunday
262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 19 Monday
263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 20 Tuesday
264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 21 Wednesday
265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 22 Thursday
266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 23 Friday
267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 24 Saturday
268	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 25 Sunday
269	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 26 Monday
270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 27 Tuesday
271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 28 Wednesday
272	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 29 Thursday
273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sep 30 Friday

APA	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	2041	2762	4343	6301	7148	9195	9195	8203	8055	7334	7785	7794	7839	6688	5718	4249	4220	3655	2546	2157	2240	1854	1674	1722	124718	Total sum
134	15	21	32	47	53	69	69	61	60	55	58	58	59	50	43	32	31	27	19	16	17	14	12	13	931	Total average
91	16	22	39	56	64	85	85	76	75	67	70	71	71	60	49	38	36	31	22	18	19	15	13	13	1111	Average workdays
43	14	18	18	29	30	34	33	29	28	28	32	31	32	27	30	18	21	20	13	12	13	11	11	12	544	Average weekends

Table 3.5.5. Daily and hourly distribution of Apatity array detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
91	2	5	2	0	12	0	8	13	18	24	22	28	19	59	39	36	72	38	24	38	59	23	47	25	613	Apr 01 Friday
92	11	68	56	56	12	45	25	33	27	15	59	10	43	105	13	23	13	15	5	13	12	13	13	8	693	Apr 02 Saturday
93	14	25	7	7	11	38	9	0	0	0	45	65	75	10	115	24	42	40	76	27	31	51	78	50	840	Apr 03 Sunday
94	61	29	93	15	4	7	0	0	7	13	14	19	8	32	50	24	23	19	31	23	36	48	30	51	637	Apr 04 Monday
95	21	31	17	13	11	9	21	0	13	27	64	130	187	141	60	28	45	95	44	127	85	59	78	102	1408	Apr 05 Tuesday
96	101	56	28	24	12	7	9	20	15	16	24	17	18	17	9	22	20	20	15	17	26	27	17	13	550	Apr 06 Wednesday
97	6	6	15	7	7	6	7	19	13	4	8	6	5	16	5	0	5	9	3	27	43	21	8	16	262	Apr 07 Thursday
98	37	25	50	17	29	16	28	35	42	20	13	120	22	92	129	38	29	29	35	25	20	29	8	37	925	Apr 08 Friday
99	30	5	27	16	11	18	16	20	21	20	61	12	18	23	29	35	17	57	57	79	43	25	19	30	689	Apr 09 Saturday
100	20	31	90	77	60	57	65	51	85	33	30	19	29	35	29	32	41	215	35	35	29	30	18	30	1176	Apr 10 Sunday
101	34	31	37	23	18	17	19	26	29	121	23	31	33	39	83	90	142	110	92	35	41	50	33	30	1187	Apr 11 Monday
102	32	21	18	10	2	5	2	4	15	2	1	11	5	1	1	28	5	15	14	7	14	16	4	1	234	Apr 12 Tuesday
103	15	4	20	18	40	27	21	12	16	22	10	16	33	22	17	18	19	19	19	14	2	5	14	1	404	Apr 13 Wednesday
104	4	12	1	4	1	3	2	11	1	4	2	10	8	3	15	33	2	5	28	32	56	68	33	48	386	Apr 14 Thursday
105	26	20	27	30	35	38	44	52	51	27	41	49	33	14	36	68	17	20	6	18	11	7	22	21	713	Apr 15 Friday
106	34	85	51	24	19	17	19	39	18	24	29	15	16	23	23	12	28	24	22	4	2	2	5	30	565	Apr 16 Saturday
107	54	2	6	1	3	0	9	4	16	29	7	5	6	11	6	5	50	35	31	12	10	13	23	9	347	Apr 17 Sunday
108	11	9	3	0	9	4	7	1	4	21	5	8	8	9	9	16	6	14	13	17	17	16	36	10	253	Apr 18 Monday
109	15	15	26	22	16	22	22	11	10	20	13	22	22	18	15	9	21	12	14	9	21	10	24	16	405	Apr 19 Tuesday
110	12	6	10	5	12	5	3	49	148	144	143	130	8	9	9	9	9	7	13	15	12	4	4	10	776	Apr 20 Wednesday
111	14	2	7	5	5	8	10	15	24	12	24	13	23	21	13	34	20	23	16	21	33	23	14	6	386	Apr 21 Thursday
112	14	8	3	4	5	4	4	4	14	13	16	15	12	7	0	5	1	5	2	10	8	1	0	1	156	Apr 22 Friday
113	3	9	16	29	24	17	36	31	16	6	23	17	18	29	6	16	9	12	7	13	10	6	12	11	376	Apr 23 Saturday
114	6	6	5	14	7	10	5	2	0	4	5	4	0	3	0	2	3	4	0	5	3	1	0	4	93	Apr 24 Sunday
115	13	3	2	13	18	7	10	12	12	11	18	20	8	17	16	16	10	19	4	11	13	11	13	12	289	Apr 25 Monday
116	12	14	9	11	11	15	23	14	21	10	11	24	16	14	4	17	6	16	9	20	19	24	6	18	344	Apr 26 Tuesday
117	4	13	16	16	14	24	22	21	13	18	15	11	14	13	17	15	11	17	19	16	14	20	10	13	366	Apr 27 Wednesday
118	9	6	6	12	17	21	16	14	12	8	10	12	10	12	13	20	9	13	17	18	11	9	8	10	293	Apr 28 Thursday
119	11	6	13	15	1	11	7	13	18	12	5	5	10	6	8	11	7	10	12	14	15	15	11	14	250	Apr 29 Friday
120	72	40	93	75	72	80	13	7	21	11	10	9	5	11	13	11	21	7	6	15	10	3	16	17	638	Apr 30 Saturday
121	15	15	14	11	4	7	14	9	3	13	12	6	18	24	11	17	15	24	17	21	26	25	10	25	356	May 01 Sunday
122	13	20	14	26	24	32	30	19	12	19	20	20	19	18	16	8	12	21	17	6	16	4	7	4	397	May 02 Monday
123	6	4	3	11	10	2	3	4	2	5	3	9	10	9	9	5	6	2	27	31	19	20	34	27	261	May 03 Tuesday
124	26	34	26	23	22	20	16	16	13	15	13	26	18	41	19	19	17	22	25	33	18	22	22	16	522	May 04 Wednesday
125	26	22	14	49	106	66	56	56	24	0	0	0	11	21	11	12	17	20	27	13	27	15	7	11	611	May 05 Thursday
126	4	12	1	11	15	28	4	9	24	18	7	10	8	13	4	4	3	4	11	5	2	9	5	3	214	May 06 Friday
127	1	5	6	7	4	13	5	3	17	5	7	7	4	10	5	3	6	10	12	5	6	3	1	6	151	May 07 Saturday
128	10	5	4	10	2	10	4	10	14	2	2	4	3	5	6	5	2	3	1	3	1	1	7	2	116	May 08 Sunday
129	10	0	2	1	0	3	1	1	9	1	5	7	5	2	14	0	1	5	8	3	9	1	2	0	90	May 09 Monday
130	2	3	1	9	10	2	8	7	1	1	1	4	6	0	4	3	2	1	1	1	1	0	0	0	68	May 10 Tuesday
131	3	0	0	2	1	1	0	0	9	0	2	7	1	6	0	1	1	10	0	10	4	5	0	0	63	May 11 Wednesday
132	1	0	3	0	3	0	0	4	4	4	1	3	3	6	4	0	0	4	1	1	3	4	2	1	52	May 12 Thursday
133	4	1	1	0	1	0	0	0	3	4	7	2	7	1	5	2	7	0	2	0	2	0	1	4	54	May 13 Friday
134	0	5	5	3	1	2	0	3	0	2	0	1	5	1	0	0	0	0	2	0	0	2	3	0	35	May 14 Saturday
135	11	0	2	0	1	1	0	2	2	7	2	1	0	12	0	5	2	0	1	1	3	7	1	0	61	May 15 Sunday
136	2	0	8	2	1	3	0	0	6	0	9	2	3	0	2	0	1	0	0	0	1	1	0	1	42	May 16 Monday
137	8	0	0	0	2	1	2	6	0	11	0	1	1	1	2	13	2	1	0	0	4	13	0	1	69	May 17 Tuesday
138	3	1	6	0	16	2	12	6	7	0	7	0	0	2	4	3	1	3	4	3	0	0	0	2	82	May 18 Wednesday
139	0	0	1	3	10	0	0	0	0	3	8	0	4	3	1	5	9	10	2	10	1	1	1	0	72	May 19 Thursday
140	0	0	0	0	4	0	1	0	0	1	1	1	1	0	0	0	0	2	2	6	2	2	11	1	35	May 20 Friday
141	0	0	3	1	0	2	2	8	0	2	5	1	1	0	0	1	1	0	0	2	5	3	1	2	40	May 21 Saturday
142	3	2	1	5	0	2	5	5	2	2	8	14	7	1	2	6	3	3	0	0	0	0	0	1	72	May 22 Sunday
143	0	5	0	9	0	4	11	0	1	7	2	3	0	3	7	8	4	1	8	3	9	5	2	5	97	May 23 Monday
144	4	1	1	6	11	1	1	1	0	1	0	6	2	0	2	13	5	1	0	1	1	5	1	0	64	May 24 Tuesday
145	4	0	0	2	6	0	0	6	6	10	4	0	2	1	1	10	2	2	11	5	2	2	7	6	89	May 25 Wednesday
146	7	1	0	7	0	0	2	11	8	2	6	3	2	7	38	5	13	3	12	6	1	2	6	4	146	May 26 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
147	0	7	0	4	3	1	0	1	1	4	0	6	9	10	0	6	2	0	3	0	3	5	0	2	67	May 27 Friday
148	6	2	1	0	0	2	2	0	4	1	3	1	6	2	1	1	1	0	2	2	3	2	7	1	50	May 28 Saturday
149	0	0	4	0	0	1	7	2	4	2	7	0	4	4	7	2	7	0	1	2	0	1	3	0	58	May 29 Sunday
150	0	0	4	0	0	0	1	3	0	2	0	0	3	0	1	2	1	0	1	6	0	2	11	2	39	May 30 Monday
151	0	0	0	3	0	3	0	9	0	4	1	4	4	0	1	0	1	10	3	1	3	3	4	2	56	May 31 Tuesday
152	3	1	5	6	3	1	3	10	2	3	1	7	2	3	1	3	2	1	8	1	1	0	1	0	68	Jun 01 Wednesday
153	0	6	0	8	7	0	1	5	9	0	0	9	3	5	2	3	5	4	4	0	2	0	1	4	78	Jun 02 Thursday
154	2	3	1	6	0	3	0	7	0	1	1	4	10	5	13	9	2	1	4	2	4	11	4	4	97	Jun 03 Friday
155	0	7	0	7	5	0	3	3	3	5	7	5	5	2	1	4	5	4	5	6	2	1	2	0	82	Jun 04 Saturday
156	0	9	2	10	3	5	13	9	2	9	2	10	3	3	4	1	2	6	6	2	1	3	2	2	109	Jun 05 Sunday
157	2	2	2	0	8	4	6	12	0	8	1	1	2	2	3	0	3	2	0	8	1	9	5	3	84	Jun 06 Monday
158	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	Jun 07 Tuesday
159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jun 08 Wednesday
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Jun 09 Thursday
161	0	0	0	0	0	0	0	0	0	2	4	4	1	7	3	3	7	4	3	3	2	7	1	1	52	Jun 10 Friday
162	1	2	2	5	6	1	4	3	3	3	2	6	4	3	8	8	5	3	5	4	12	2	4	7	103	Jun 11 Saturday
163	4	5	2	1	2	10	4	6	25	14	16	9	26	36	28	18	20	4	5	7	19	9	10	24	304	Jun 12 Sunday
164	19	5	2	2	3	1	3	4	0	4	2	2	2	3	0	6	1	1	1	2	1	4	4	0	72	Jun 13 Monday
165	6	1	0	5	2	0	5	1	0	1	1	0	2	2	2	1	1	0	1	8	1	4	1	1	46	Jun 14 Tuesday
166	0	2	0	1	0	2	0	1	0	4	12	4	2	3	2	2	7	15	27	12	10	6	0	7	119	Jun 15 Wednesday
167	5	3	8	7	8	4	6	8	1	6	6	2	4	3	0	8	4	8	2	2	4	0	6	6	111	Jun 16 Thursday
168	2	0	1	0	2	9	1	13	5	5	7	9	8	16	8	11	3	3	5	5	7	2	3	18	143	Jun 17 Friday
169	3	3	3	15	6	3	2	1	7	6	3	9	3	2	1	0	0	0	1	3	1	1	0	11	84	Jun 18 Saturday
170	39	84	5	43	31	38	90	53	39	33	71	56	23	34	35	58	44	7	35	22	12	63	65	15	995	Jun 19 Sunday
171	7	5	13	31	9	3	29	83	87	14	9	48	59	43	24	3	4	8	6	0	1	1	0	10	497	Jun 20 Monday
172	4	4	5	0	2	2	6	8	10	3	8	3	4	6	17	6	5	8	4	11	2	3	5	2	128	Jun 21 Tuesday
173	4	3	0	1	2	4	7	19	3	1	2	7	9	5	1	1	6	3	7	1	0	1	0	1	88	Jun 22 Wednesday
174	2	2	1	0	9	1	3	2	3	2	4	9	8	3	1	1	1	1	0	0	0	2	0	2	57	Jun 23 Thursday
175	1	1	5	6	5	3	15	4	15	3	3	5	7	6	9	10	1	2	0	0	2	21	17	7	148	Jun 24 Friday
176	4	3	6	5	2	2	1	1	15	2	2	5	7	10	1	0	5	4	1	2	6	12	2	1	99	Jun 25 Saturday
177	9	2	3	20	13	2	2	6	10	0	1	2	5	1	0	1	1	6	1	2	1	1	4	1	94	Jun 26 Sunday
178	7	0	4	2	3	3	2	13	3	3	7	1	6	0	2	16	8	4	2	1	0	3	2	3	95	Jun 27 Monday
179	3	7	1	3	2	10	10	5	10	3	2	2	2	4	11	4	2	1	3	2	4	6	0	2	99	Jun 28 Tuesday
180	4	1	2	2	1	4	2	5	9	2	8	15	7	38	20	8	3	10	8	7	9	8	6	20	199	Jun 29 Wednesday
181	16	0	7	2	11	3	1	5	4	9	27	7	7	7	2	9	3	10	11	9	9	9	11	9	188	Jun 30 Thursday
182	11	10	10	14	6	15	2	7	15	14	11	3	2	2	1	1	1	13	5	7	6	9	4	1	170	Jul 01 Friday
183	2	1	4	6	4	1	7	4	4	10	8	7	8	2	2	2	6	3	3	3	1	3	1	8	100	Jul 02 Saturday
184	9	9	5	1	0	4	3	4	4	0	3	5	2	3	6	6	2	11	7	6	9	7	7	12	125	Jul 03 Sunday
185	5	8	9	12	25	9	12	24	17	4	72	23	10	23	1	7	9	0	0	0	0	0	0	0	270	Jul 04 Monday
186	0	0	0	0	0	0	0	0	17	1	4	20	20	8	18	8	9	3	1	3	6	4	14	0	136	Jul 05 Tuesday
187	7	3	6	6	7	4	11	11	3	6	2	29	22	29	77	54	55	89	50	117	89	81	48	78	884	Jul 06 Wednesday
188	9	11	16	78	27	6	5	3	3	2	4	2	0	1	8	6	1	4	0	1	0	4	4	2	197	Jul 07 Thursday
189	3	2	3	6	0	3	3	3	2	1	2	0	0	0	2	0	1	0	0	0	13	2	1	2	49	Jul 08 Friday
190	1	3	0	6	2	5	3	0	6	3	3	4	1	3	2	1	1	1	3	4	3	4	1	3	63	Jul 09 Saturday
191	8	2	5	3	4	2	1	2	2	4	3	2	5	4	1	4	3	4	2	3	5	6	3	4	82	Jul 10 Sunday
192	8	6	10	10	10	8	5	7	5	2	7	15	7	8	59	23	3	34	46	72	22	17	12	12	408	Jul 11 Monday
193	5	8	10	14	10	8	8	9	4	2	1	4	3	2	7	2	0	0	0	2	3	6	1	9	118	Jul 12 Tuesday
194	13	15	12	10	6	2	8	3	1	3	3	5	2	17	5	7	3	2	6	6	7	1	3	3	143	Jul 13 Wednesday
195	12	7	10	6	6	4	6	15	9	6	8	4	7	5	7	16	22	18	29	15	5	7	15	9	248	Jul 14 Thursday
196	2	13	10	5	7	3	4	4	6	4	4	10	3	6	16	30	31	52	41	11	14	14	12	12	314	Jul 15 Friday
197	14	20	19	21	14	8	9	14	12	9	22	9	13	15	5	8	20	16	37	18	38	29	10	17	397	Jul 16 Saturday
198	12	26	25	11	25	13	16	28	22	12	8	15	10	9	7	8	6	2	13	2	9	8	7	9	303	Jul 17 Sunday
199	4	6	8	14	12	5	7	7	14	9	4	8	7	10	11	6	8	6	4	11	14	9	8	2	194	Jul 18 Monday
200	11	13	13	21	12	18	17	28	14	25	15	20	25	25	21	22	13	6	12	4	13	4	2	19	373	Jul 19 Tuesday
201	9	4	4	5	3	7	6	12	9	7	10	8	6	18	23	4	6	3	0	0	0	0	0	0	144	Jul 20 Wednesday
202	0	0	0	0	0	0	0	0	0	0	0	5	5	12	15	3	17	1	21	18	4	3	3	1	108	Jul 21 Thursday

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Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
203	9	3	3	5	1	3	2	15	7	12	6	12	11	12	11	19	8	12	7	12	6	6	7	17	206	Jul 22 Friday
204	7	16	9	33	11	15	16	29	18	22	16	16	7	7	9	6	29	16	9	7	14	12	18	11	353	Jul 23 Saturday
205	6	7	9	7	6	3	12	9	2	4	2	5	4	3	11	8	7	4	23	10	2	12	20	7	183	Jul 24 Sunday
206	12	13	7	9	16	29	19	37	50	28	16	24	21	9	21	23	24	30	18	20	29	27	40	29	551	Jul 25 Monday
207	21	25	18	37	32	34	20	29	19	28	9	9	11	5	3	8	5	9	7	10	13	16	15	34	417	Jul 26 Tuesday
208	24	36	36	29	35	14	14	15	12	7	15	1	9	13	20	31	53	51	16	15	22	18	14	10	510	Jul 27 Wednesday
209	4	12	17	40	45	48	57	81	36	50	43	53	67	57	77	75	31	33	27	37	24	40	39	31	1024	Jul 28 Thursday
210	37	29	31	25	23	40	24	20	24	27	18	17	24	28	42	33	44	62	63	44	41	37	36	23	792	Jul 29 Friday
211	25	35	35	20	29	12	17	12	17	18	8	12	8	10	5	2	5	4	4	1	1	0	9	2	291	Jul 30 Saturday
212	2	5	6	8	10	15	8	5	2	3	2	1	4	6	3	3	5	6	7	1	5	3	12	11	133	Jul 31 Sunday
213	6	12	8	13	39	53	28	40	27	6	16	17	15	34	25	23	20	16	11	15	11	16	28	15	494	Aug 01 Monday
214	12	21	8	15	12	6	12	13	14	5	12	16	11	17	7	0	0	0	0	0	0	0	0	0	181	Aug 02 Tuesday
215	0	0	0	0	0	0	0	10	4	18	5	3	14	2	1	15	12	1	8	0	8	5	4	5	115	Aug 03 Wednesday
216	5	1	7	3	8	6	9	6	4	6	5	9	8	8	5	6	6	7	4	4	5	3	2	5	132	Aug 04 Thursday
217	11	9	11	11	15	4	11	4	15	10	11	11	7	6	17	44	101	36	22	17	8	3	5	3	392	Aug 05 Friday
218	1	6	5	9	3	3	1	6	6	10	12	18	13	9	17	8	9	5	9	6	8	8	5	7	184	Aug 06 Saturday
219	6	6	6	5	9	12	13	5	8	1	0	2	2	2	8	3	2	1	7	2	12	6	5	4	127	Aug 07 Sunday
220	4	6	3	8	9	6	11	11	11	4	5	6	6	14	6	8	4	17	3	2	1	7	7	13	172	Aug 08 Monday
221	7	7	3	2	1	3	13	7	3	5	6	4	7	3	1	1	20	7	7	6	5	5	3	9	135	Aug 09 Tuesday
222	1	5	1	5	3	3	4	3	7	2	6	10	14	3	8	16	22	5	16	5	5	9	9	12	174	Aug 10 Wednesday
223	5	4	12	5	2	6	6	11	3	5	2	4	4	5	5	2	9	5	7	5	4	4	5	2	122	Aug 11 Thursday
224	14	5	13	8	10	5	5	2	10	12	7	5	4	3	14	8	9	6	5	1	0	2	0	4	152	Aug 12 Friday
225	4	0	4	5	12	1	6	6	4	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	49	Aug 13 Saturday
226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 14 Sunday
227	0	0	0	0	0	0	0	0	0	5	4	3	3	13	11	5	1	14	3	8	4	5	2	4	85	Aug 15 Monday
228	13	3	8	2	15	8	1	0	10	3	10	8	8	2	2	2	25	17	17	9	2	4	12	10	191	Aug 16 Tuesday
229	6	0	2	5	9	2	4	5	2	7	1	3	4	6	5	5	4	3	2	10	6	1	25	12	129	Aug 17 Wednesday
230	3	7	4	9	19	5	1	1	1	2	1	7	1	1	7	0	3	3	1	2	9	2	3	5	97	Aug 18 Thursday
231	0	8	2	9	8	7	8	5	22	20	16	6	4	2	8	1	12	1	8	3	11	18	11	12	202	Aug 19 Friday
232	12	9	11	17	5	1	3	5	1	2	2	2	8	10	2	1	4	1	1	16	14	13	9	4	153	Aug 20 Saturday
233	4	1	8	8	5	3	5	4	7	6	11	4	3	2	3	11	9	9	5	10	11	5	7	7	148	Aug 21 Sunday
234	6	10	0	10	7	0	11	2	2	4	5	1	19	4	0	0	0	0	0	0	0	0	0	0	81	Aug 22 Monday
235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 23 Tuesday
236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 24 Wednesday
237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 25 Thursday
238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7	6	6	6	4	0	32	Aug 26 Friday
239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Aug 27 Saturday
240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	102	104	77	287	Aug 28 Sunday
241	128	67	93	106	94	55	48	72	182	20	0	0	0	0	0	0	0	0	2	0	7	1	0	1	876	Aug 29 Monday
242	0	1	0	0	0	0	37	22	20	9	17	34	86	119	186	18	18	34	134	64	50	54	36	33	972	Aug 30 Tuesday
243	32	30	22	41	38	21	31	78	216	12	43	23	35	24	22	21	26	0	0	0	0	0	43	46	804	Aug 31 Wednesday
244	46	47	46	28	44	23	20	5	21	0	52	30	31	40	35	57	41	35	14	31	38	48	18	21	771	Sep 01 Thursday
245	34	13	24	45	36	32	20	16	20	19	15	18	19	18	35	36	21	35	36	21	29	29	29	19	619	Sep 02 Friday
246	26	20	21	46	29	18	24	27	12	18	25	10	19	18	18	42	15	31	32	25	27	19	32	20	574	Sep 03 Saturday
247	29	16	35	32	8	15	39	26	22	25	28	16	35	11	33	50	35	24	29	29	69	73	31	24	734	Sep 04 Sunday
248	54	25	34	22	17	38	13	20	18	50	19	60	35	23	10	24	23	33	14	32	32	40	40	29	705	Sep 05 Monday
249	18	34	36	24	32	29	36	18	33	21	23	30	19	24	20	21	41	26	33	41	23	14	14	25	635	Sep 06 Tuesday
250	22	33	27	24	41	30	28	32	21	18	30	32	37	23	35	21	15	36	32	36	30	51	54	72	780	Sep 07 Wednesday
251	91	60	49	40	43	45	25	58	56	61	73	32	35	43	55	24	13	33	43	68	73	54	31	29	1134	Sep 08 Thursday
252	27	35	42	25	51	21	46	62	44	25	38	35	24	28	83	133	36	28	164	102	41	25	42	19	1176	Sep 09 Friday
253	37	118	155	134	41	46	191	24	17	27	29	38	65	53	17	25	60	70	214	136	16	16	29	99	1657	Sep 10 Saturday
254	71	33	33	27	30	33	15	17	18	20	20	94	13	41	160	99	207	95	139	31	219	221	105	20	1761	Sep 11 Sunday
255	13	25	30	23	192	368	131	205	286	81	56	31	59	15	13	14	19	13	17	19	12	13	13	22	1670	Sep 12 Monday
256	12	22	16	18	25	16	40	31	18	21	16	33	27	25	19	21	25	37	27	24	19	15	25	26	558	Sep 13 Tuesday
257	10	35	26	21	22	37	34	22	25	17	16	23	20	29	29	28	20	16	20	26	18	35	19	19	567	Sep 14 Wednesday
258	14	0	0	0	14	12	33	26	39	22	20	17	30	28	15	23	9	32	24	31	27	19	36	31	502	Sep 15 Thursday

Table 3.5.6 (Page 3 of 4)

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
259	30	17	36	30	34	26	24	18	25	22	28	33	14	14	20	30	17	12	19	34	16	36	20	34	589	Sep 16 Friday
260	26	23	31	20	27	43	29	22	31	38	34	22	30	24	17	21	36	31	31	32	36	31	27	41	703	Sep 17 Saturday
261	31	28	24	47	23	31	24	42	32	28	37	34	34	33	39	39	45	34	34	38	35	45	69	62	888	Sep 18 Sunday
262	61	76	57	57	71	45	63	49	50	40	40	44	36	52	34	37	50	39	41	44	34	69	53	31	1173	Sep 19 Monday
263	33	37	37	33	26	40	40	19	20	18	37	38	31	13	14	38	11	30	19	28	25	37	30	27	681	Sep 20 Tuesday
264	23	16	38	26	37	12	35	49	33	48	14	43	28	23	41	34	20	24	28	28	53	24	28	30	735	Sep 21 Wednesday
265	33	24	24	41	30	29	15	39	34	29	29	35	41	36	16	19	30	20	17	21	21	36	19	34	672	Sep 22 Thursday
266	35	39	34	31	35	38	42	40	94	31	48	70	29	68	26	29	39	27	28	40	30	31	59	37	980	Sep 23 Friday
267	52	42	21	15	28	14	21	25	25	20	14	23	15	19	22	27	19	26	16	7	17	27	34	28	557	Sep 24 Saturday
268	25	24	34	31	20	34	41	31	46	25	41	39	41	24	31	33	23	26	37	24	33	21	34	37	755	Sep 25 Sunday
269	26	51	25	28	25	21	26	20	24	25	29	39	27	24	26	33	16	35	27	37	54	28	21	18	685	Sep 26 Monday
270	29	11	33	34	21	16	40	45	126	58	13	25	21	14	27	22	38	29	27	28	26	12	12	29	736	Sep 27 Tuesday
271	25	12	24	20	19	20	21	18	6	12	10	12	6	9	24	18	20	20	17	19	57	20	20	17	446	Sep 28 Wednesday
272	17	8	10	45	52	14	209	95	17	76	152	18	65	187	154	117	74	49	14	38	41	28	40	26	1546	Sep 29 Thursday
273	32	27	13	15	25	104	29	26	15	16	14	23	21	29	18	22	17	31	40	26	21	33	35	39	671	Sep 30 Friday

SPI 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Sum 2438 2744 2733 2964 2454 2842 2946 2843 2896 2782 2816 2580
2583 2587 2763 2901 3364 2688 2666 3143 2807 3017 2790 2642 66989 Total sum

SPI	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
176	15	14	15	16	16	16	16	17	19	14	15	16	15	17	18	16	16	16	17	16	16	16	15	15	381	Total average
121	14	12	13	14	17	16	16	18	22	15	15	17	16	17	18	17	15	16	16	17	15	15	14	14	378	Average workdays
55	15	17	18	18	12	13	16	12	13	11	14	13	13	15	16	14	18	18	19	14	17	19	18	16	369	Average weekends

Table 3.5.6. Daily and hourly distribution of Spitsbergen array detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

3.6 IMS operation

The Intelligent Monitoring System (IMS) was installed at NORSAR in December 1989 and was operated at NORSAR from 1 January 1990 for automatic processing of data from ARCESS and NORESS. A second version of IMS that accepts data from an arbitrary number of arrays and single 3-component stations was installed at NORSAR in October 1991, and regular operation of the system comprising analysis of data from the 4 arrays ARCESS, NORESS, FINESS and GERESS started on 15 October 1991. As opposed to the first version of IMS, the one in current operation also locates events at teleseismic distance.

Data from the Apatity array were included on 14 December 1992, and from the Spitsbergen array on 12 January 1994. Due to missing calibration information for the new Guralp SP sensors installed in the Spitsbergen array in late August, detections from the Spitsbergen array were not used in the automatic phase association after 1 September 1994, but the detections were available to the analysts and could be added manually during analysis.

The operational stability of IMS has been very good during the reporting period. In fact the IMS event processor (pipeline) has had no downtime of its own; i.e., all data available to IMS have been processed by IMS.

Phase and event statistics

Table 3.6.1 gives a summary of phase detections and events declared by IMS. From top to bottom the table gives the total number of detections by the IMS, the number of detections that are associated with events automatically declared by the IMS, the number of detections that are not associated with any events, the number of events automatically declared by the IMS, the total number of events defined by the analyst, and finally the number of events accepted by the analyst without any changes (i.e., from the set of events automatically declared by the IMS)

Due to reductions in the FY94 funding for IMS activities (relative to previous years), new criteria for event analysis, effective from January 1, 1994 were introduced. Since that date, only regional events in areas of special interest (e.g, Spitsbergen, since it is necessary to acquire new knowledge in this region) or other significant events (e.g, felt earthquakes and large industrial explosions) have been thoroughly analyzed. Teleseismic events are analyzed as before.

	Apr 94	May 94	Jun 94	Jul 94	Aug 94	Sep 94	Total
Phase detections	67287	61976	70465	72409	47220	44911	364268
- Associated phases	8139	8394	8661	7677	9229	7262	49362
- Unassociated phases	59148	53582	61804	64732	37991	37649	314906
Events automatically declared by IMS	2354	2406	2549	2227	2846	2336	14718
No. of events defined by the analyst	384	455	410	386	556	359	2550
No. of events accepted without modifications	1	0	46	11	6	3	67

Table 3.6.1. IMS phase detections and event summary.

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4 Improvements and Modifications

4.1 NORSAR

NORSAR data acquisition

The current NORSAR data acquisition system was described in NORSAR Sci. Rep. No. 2-93/94, and is functioning as a backup system until the refurbishment of NORSAR array is finished. The system has been running satisfactorily during the whole reporting period.

NORSAR detection processing

The NORSAR detection processor has been running satisfactorily. To maintain consistent detection capability, the NORSAR beam tables have not been changed.

Detection statistics for the NORSAR array are given in section 2.

NORSAR event processing

The routine processing of NORSAR events was described in NORSAR Sci. Rep No 2-93/94. The process continues to use a data base with time delay corrections and slowness corrections for location calibration that was established in 1974 (Berteussen, 1974). This data base still gives valuable corrections for the NORSAR array, but the data base itself is technically based on old IBM architecture disk files. The correction subroutines and disk file access routines have been converted to give identical results on SUN and the old IBM system. However, this data base is in today's technology outdated, and an effort to create a new data base is given high priority.

NORSAR refurbishment

All the new Science Horizons data acquisition hardware and software have been acquired and delivered. See NORSAR Sci. rep. No. 2-93/94 for a system description. The data acquisition software XAVE and communication interface module CIM II were installed on October 5, 1994 at NDPC. At subarray 06C, a CIM II was installed in the Central Terminal Vault - CTV, and an AIM24-1 has been installed in one remote SP vault (SPV) for testing purposes. The data acquisition is running satisfactorily.

Between every SPV and CTV, the data will be transmitted using ADCCP protocol and asynchronous modems. These modems require DC power, and together with one AIM24-1 and one GPS clock, this equipment consumes almost all the power we can deliver at the remote sites. To give DC power out to the remote sites and to get data back, we now need to use additional pairs from the buried cables as compared to the old analog data transmission. This means that cable pairs that used to be spares, will now be used as power cables, and cable problems earlier not detected will now be exposed. The consequence is that many more cable repairs than initially predicted will be needed.

Boreholes in the seven LPVs for the KS5400P seismometers have been drilled. Contractual arrangements for the delivery of "posthole" KS54000 seismometers have been completed.

Although several technical problems have delayed the refurbishment, we are still planning to send NORSAR data to IDC during the GSETT-3 experiment.

4.2 Regional Arrays

DP - *Detection processing*

The routine detection processing of the arrays is running satisfactorily on each of the arrays' SUN-3/280 or Sparcstation 1 acquisition systems. The same program is used for NORSAR, NORESS, ARCESS, FINESA, GERESS, Apatity and Spitsbergen, but with different "recipes". The beam table for NORESS and ARCESS is found in NORSAR Sci. Rep. No. 1-89/90. The beam table for FINESA and GERESS is found in NORSAR Sci. Rep. No. 1-90/91. The beam table for Apatity is found in NORSAR Sci. Rep. No. 1-92/93, and that for Spitsbergen is found in NORSAR Sci.Rep. No. 2-92/93.

Detection statistics are summarized in section 3.

EP_SigPro - *Signal processing. Phase estimation*

This process performs f-k and polarization analysis for each detection to determine phase velocity, azimuth and type of phase, and the results are stored in the ORACLE detection and arrival tables for use by the IMS.

Some modifications have been done as a result of IDC testing.

EP_Ronapp - *Event Processing. Plot and epicenter determination*

A description of single-array event processing is found in NORSAR Sci. Rep. No. 2-88/89, and NORSAR Sci. Rep. No. 2-89/90.

J. Fyen

Reference:

Berteussen, K.A. (1974): NORSAR Location calibrations and time delay corrections, NORSAR Scientific Report No. 2-73/74, Kjeller, Norway.

5 Maintenance Activities

Activities in the field and at the Maintenance Center

This section summarizes the activities at the Maintenance Center (NMC) Hamar, and includes activities related to monitoring and control of the NORSAR teleseismic array, as well as the NORESS, ARCESS, FINESS, GERESS, Apatity and Spitsbergen small-aperture arrays.

Activities involve preventive and corrective maintenance, planning and activities related to the refurbishment of the NORSAR teleseismic array.

NORSAR

Visits to subarrays in connection with:

- Adjusted gain and offset, SP/LP channels
- Demounted equipment in the 06C CTV
- Power failures at 01A and 02B
- Construction of concrete floor and painting work at 06C CTV

NMC

- Continued the NORSAR refurbishment preparations
- Prepared for the Spitsbergen expedition

NORESS

- Repaired damage caused by lightning

ARCESS

- Replaced fiber optical transmitters and adjusted optical link

Spitsbergen

- Replaced decoder in Longyearbyen
- Buried all cables between the HUB and remote sites (approx. 5 km of cables)
- Installed wellhead vaults at all remote sites
- Replaced old battery bank with new NiCa batteries
- Replaced Teledyne S-500 seismometers with Guralp CMG-3V instruments
- Installed a 3-component broadband instrument in borehole at site B4
- Expanded the station "hut" with two "storerooms"
- Replaced a defective windmill

Additional details for the reporting period are provided in Table 5.1.

Subarray/ area	Task	Date
NORSAR		April
02C	Adjusted DC offset and gain on SP channels Adjusted SP and LP channels	12 Apr
NMC	NORSAR refurbishment work continued.	April
		May
ARCESS	B4, C2, C4, D2 and D3: Replaced fiber opitcal transmitters Adjusted optical link, all channels	2-5 May
Sptisbergen	Replaced decoder, Longyearbyen	6 May
NMC	Continued NORSAR refurbishment work Began preparations for expedition to Spitsbergen	May
NORSAR		June
06C	Demounted the equipment in the CTV Began preparations for making new concrete floor	27-28 Jun
NMC	Continued NORSAR refurbishment work Continued preparations for the expedition to Spitsbergen	June
NORSAR		July
01A	Subarray visited due to power failure	19 Jul
02B	Subarray visited due to failure on the 1000 V AC powerline.	19 Jul
02B	Bad insulators found at two different places.	21 Jul
02B	Replaced RD6 due to failure on the power supply card, damaged by lightning.	25 Jul
06C	Made new concrete floor in CTV.	1 Jul
06C	Replaced RD6 due to failure on power supply card. Replaced modem, which had been damaged by lightning Adjusted gain on all SP channels. Checked MP and FP, LP-Z.	12 Jul

Subarray/ area	Task	Date
NORESS	Replaced Hub 10 processor card because of spike problems after thunderstorm	4 Jul
	Repaired Hub power system, damaged by lightning	8 Jul
	Repaired Hub 14 digital interface card, damaged by lightning Restarted the UPS system	27 Jul
NMC	Continued NORSAR refurbishment work Continued preparations for the expedition to Spitsbergen	July
NORSAR		August
06C	Painted the floor and walls of the CTV	15 Aug
Spitsbergen	All cables between the Hub and the remote sites were buried (approx. 5 km), as required by local authorities. Wellhead vaults were installed at all remote sites. The old battery bank was replaced with new NiCa batteries. The Teledyne S-500 seismometers were replaced with Guralp CMG-3V instruments. A 3-component broadband instrument (Guralp CMG-3T) was installed on top of the SP-vertical instrument in borehole 4. The station hut was expanded with two "storerooms".	22 Aug - 2 Sep
NMC	Continued NORSAR refurbishment work.	August
NORSAR	Preparations were made for installation of Science Horizons equipment in the subarray vaults. Experimental testing of VSAT-transmission from one subarray was carried out.	September
NMC	Continued the NORSAR refurbishment work.	September

Table 5.1. Activities in the field and the NORSAR Maintenance Center, including NDPC activities related to monitoring and control of the NORSAR array, as well as the NORESS, ARCESS, FINESS, GERESS, Apatity and Spitsbergen small-aperture arrays during 1 April - 30 September 1994.

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6 Documentation Developed

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Kværna, T. and F. Ringdal (1994): A system for continuous seismic threshold monitoring, final report, in *Semiann. Tech. Summ. 1 Apr - 30 Sep 94*, NORSAR Sci. Rep. 1-94/95, Kjeller, Norway.

Mykkeltveit, S., U. Baadshaug, J. Fyen and B.Kr. Hokland (1994): The Lop Nor nuclear explosions of 10 June and 7 October 1994, in *Semiann. Tech. Summ. 1 Apr - 30 Sep 94*, NORSAR Sci. Rep. 1-94/95, Kjeller, Norway.

Ringdal, F. and T. Kværna (1994): On the reliability of event location estimates from automatic and interactive processing, in *Semiann. Tech. Summ. 1 Apr - 30 Sep 94*, NORSAR Sci. Rep. 1-94/95, Kjeller, Norway.

Schweitzer, J. (1994): Mislocation vectors for small aperture arrays -- a first step towards calibrating GSETT-3 stations, in *Semiann. Tech. Summ. 1 Apr - 30 Sep 94*, NORSAR Sci. Rep. 1-94/95, Kjeller, Norway.

Semiannual Tech. Summary, 1 Oct 93 - 31 Mar 94, NORSAR Sci. Rep. 2-93/94, NORSAR, Kjeller, Norway.

Skorve, J. (1994): Epicenter location and cratering at the Novaya Zemlya underground nuclear test site, in *Semiann. Tech. Summ. 1 Apr - 30 Sep 94*, NORSAR Sci. Rep. 1-94/95, Kjeller, Norway.

7 Summary of Technical Reports / Papers Published

7.1 A system for continuous seismic threshold monitoring, final report

Introduction

In the previous NORSAR Semiannual Technical Summary, we outlined the general approach and the implementation considerations of the continuous seismic threshold monitoring (CSTM) system (Kværna et al, 1994a). We have now completed the development, and we will in this report describe the automatic processing flow, outline the key functions of the interactive analysis, discuss the output produced by this system, and finally outline possible future modifications and extensions.

Processing flow

The CSTM system is logically divided into two parts; the continuous processing modules and the interactive analysis modules. A flowchart of the processing modules is given in Fig. 7.1.1, and comments on the different steps are given in the following.

The basis for all calculations are the diskloops with continuous seismic data from the network stations. Following the recording onto the diskloops, the seismic data for each station is subjected to beamforming (arrays only), bandpass filtering and short-term-average (STA) calculations. The continuous STA data are then stored onto new diskloops with a typical sampling rate of 1 Hz.

The STA data for each station is subsequently used for calculation of the network upper magnitude thresholds. In our previous report (Kværna et al, 1994a), we showed that the term log (A/T) in the magnitude relation can be well approximated by log (STA) multiplied by a constant that is specific for each instrument and bandpass filter. These constants are found from analysis of representative event segments, and for standard short-period instruments, these constants are often very close to the displacement response value at 1 Hz.

The calculation of network magnitude thresholds from a large number of stations (~50) is a computer intensive task. Using a sampling interval of 10 s and a global grid of 2562 targets, it took about 50 minutes to process 60 minutes of data on a Sparcstation 20 (60 MHz). In comparison, the computational load of the STA calculations for each station is rather low. The continuous network magnitudes for each of the nodes of the global grid system is written onto a new diskloop. These data are stored in demultiplexed form to facilitate fast read access for plotting of time series.

The final step in the processing flow is to interpolate and reformat the magnitude thresholds to multiplexed form. This makes reading of the threshold data for a given time very fast, and enables us to rapidly update displays of magnitude thresholds onto different types

of map sections. The computational load of this module is modest compared to the calculation of the actual magnitude thresholds.

Interactive analysis

A detailed description of and examples from the different interactive analysis options are given in the Continuous Seismic Threshold Monitoring User's Guide (Kværna et al, 1994b), that is available from NORSAR upon request. A schematic overview of the functionality of and the interaction between the different interactive analysis modules is shown in Fig. 7.1.2.

- **The TM trace displayer:** The main function of this module is to display time-series of magnitude thresholds for given target regions. The selection of targets can be done from the trace displayer itself, or alternatively, from interactive selection of targets using the TM map overlay module. The traces can be plotted normalized or on a fixed scale, such that time intervals with high thresholds stand out clearly.

  Events from various bulletins can also be shown. The main purpose of this option is to associate increased thresholds with signals from actual events.

  For a quantitative assessment of the magnitude thresholds, displays of both peak statistics and cumulative distributions are available.

- **The TM map overlay module:** In order to show how the magnitude thresholds vary as a function of geographical position, we have the possibility to display colored snapshots of the magnitude thresholds onto various map sections. A large selection of predefined map sections are already available, and new sections can easily be generated.

  The time of the snapshot can be set from the TM map overlay module itself, or alternatively, from interactive cursor control using the TM trace displayer. This interaction allows us to investigate the time-space variation of the magnitude thresholds, and is therefore a valuable tool for identifying time intervals and regions with increased thresholds. To further investigate the cause of the increased thresholds, located events can be plotted onto the maps for a predefined time interval around the origin time of the events.

  An example of global magnitude threshold variations during the occurrence of a major earthquake is given in Fig. 7.1.3.

  After interactively selecting a time interval on the trace displayer, we also have the possibility to sequentially update the colored magnitude thresholds within the selected time interval. This kind of animation can be very instructive to understand how increased noise levels and seismic events influence the global magnitude thresholds.

  Another option of the TM map overlay module is to update the colored thresholds at regular intervals, with a given lag behind real-time (e.g., one hour). This lag is necessary to accommodate the arrival of phases with the largest travel-times, as well as

the time needed to process the data. With a modification to the algorithm for threshold calculations, this function can be used for a continuous assessment of the detection capability of the network.

- **The World Map:** One purpose with this module is to show the station distribution of the network used in the calculation of the magnitude thresholds. Another application is to display the location of events in the available bulletins. On the TM trace displayer we may interactively select events and by using inter-process communication we may plot the events onto the world map.

Interpretation of derived magnitude thresholds

We have noticed that there have been some misunderstandings on the interpretation of the magnitude thresholds computed by the CSTM system. It is important **not** to consider the values as a 90 per cent network detection threshold, since we have not taken into account a signal-to-noise ratio which would be required in order to detect an event.

However, if we exclude the time intervals where our network actually detected and located an event in the target region, we may use the following interpretation:

"We are confident (at the 90 per cent level) that no events larger than the calculated thresholds occurred in the area".

Practical monitoring of a given target region (e.g., of a 24 hour time interval) should be done in the following way:

- Check to see if the network bulletin has reported any events located in the target region. If so, identify the threshold peaks associated with the located events.
- Attempt to associate the largest peaks in the threshold trace to events located outside the target area. In theory, it may have been possible that an explosion in the target area could have been hidden in the coda of the interfering event, but this requires that the origin time of the explosion coincided with the time of the threshold peak. However, due to the short time periods with significant threshold peaks, the probability of such a coincidence is very small. For further discussion on this topic, see Kværna (1992).
- Use the threshold trace to determine a magnitude reference level for which all exceedances are caused by signals from known events. We may then conclude: We are confident (at the 90 per cent level) that no events larger than the magnitude reference level occurred in the target region during this time period.

In this way, the analyst can rapidly get an assessment of the possible seismic activity in the target region during the given time interval. This will also enable him to focus his analysis on the short time intervals when "real" evasion opportunities exist.

Uncertainty considerations

Generic global attenuation and travel-time curves form the basis for the network magnitude calculations (see Figs. 7.1.4a and 7.1.4b). As is well known, the attenuation curves are accompanied with significant uncertainties. E.g., the studies made on P-wave amplitude variability (Veith and Clawson, 1972; Lilwall, 1986; Ringdal and Fyen, 1979) indicate a standard deviation of 0.35-0.40 magnitude units. If reliable regional corrections are available, the uncertainty can be reduced somewhat. In the calculation of the network magnitude thresholds, these uncertainties are taken into account.

There are also other factors in the calculation of magnitude thresholds that are associated with uncertainties. These are:

- The use of log(STA) as a representation of log (A/T)
- The effect of beamforming, filtering and different instrument responses on the seismic amplitude
- Instrument calibration
- The effect of each target point representing a finite geographical area.

We have during our development of the CSTM system used the strategy of being conservative with respect to the estimation of upper magnitude thresholds. Missing information on the exact values of the different parameters are therefore compensated for by assuming conservative values or by increasing the uncertainty. With this in mind, it is obvious that the quality of the output from the CSTM system can be significantly improved. By conducting additional studies, more precise estimates of the parameters and their associated uncertainties can be obtained, and we can thereby lower the derived magnitude thresholds and/or increase the degree of confidence.

Future improvements

The by far largest uncertainties involved in the magnitude threshold calculations are associated with the use of generic global attenuation relations. Ideally, one would for each network station like to derive regionalized attenuation curves for the entire globe, but this is an extremely complex undertaking that is unlikely to be done in the near future. There are, however, some improvements that can be made without such extensive efforts.

First of all, known station biases should be taken into account. We are especially worried about stations with large negative biases, because this may give rise to unrealistically low magnitude thresholds. Along the same lines, we would for each station like to identify and introduce corrections to regions with very extreme amplitude anomalies. Also in this case, the large negative biases cause the largest problems.

It should be emphasized that the calculation of network magnitude thresholds is not an averaging process, but is very sensitive to outliers in the population of individual station magnitude estimates. For a large network of more than 50 stations it may often happen

that some of the stations are not operating properly, e.g., due to low gain. For such a large network it may be necessary to introduce an additional outlier rejection algorithm before calculating the actual magnitude thresholds.

On the other hand, this sensitivity to outliers can be used as a quality control of the stations in the network, and this application should be explored further.

The program module calculating the STA data for each station is a modified version of the detector program (DP) program developed at NORSAR. When intervals with bad data occur (spikes, gaps, clipped data, calibration signals), we have already procedures in place that take actions that are sufficient for operating a detector. However, for computing of threshold magnitudes, we should not allow any bad data to be included at all. It is therefore necessary to implement additional routines that identify all time intervals with bad data for any given station, such that all these intervals can be discarded from further processing for that station.

Both the relation between log (STA) and log (A/T) and the signal loss due to beamforming and filtering have turned out to vary among the different seismic stations. In order to obtain precise estimates of the relations, we have to analyze a representative number of events for each station in the network. In the current version of the CSTM system, we have only used conservative generic relations, and even a limited effort of analyzing only 3-5 events per station would significantly improve the precision of the magnitude threshold estimates.

As explained earlier in this report, the derived magnitude thresholds should not be interpreted as a 90 per cent network detection threshold. But by modifying the algorithm to take into account a predefined signal-to-noise ratio (SNR) as well as the number of stations required to detect an event, the maps generated by the CSTM system can be made very similar to the standard capability maps produced by programs like SNAP/D or Networth.

Conclusions

The main focus during the development of the CSTM system has been to develop an environment that facilitates both real-time operation as well as testing of new ideas in the context of continuous seismic threshold monitoring. The current operational system is not fully optimized with respect to processing parameters, but the framework for a stepwise improvement exists. We can as of today demonstrate the potentials of using continuous seismic threshold monitoring as a part of a global seismic verification system, but some caution has to be taken during the interpretation of the derived magnitude thresholds. Further improvements will rely heavily on the possibility of conducting extensive event analysis and associated calibration efforts.

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Veith, K.F. and G.E. Clawson (1972): Magnitude from short-period P-wave data, *Bull. Seism. Soc. Am.*, 62, 435-453

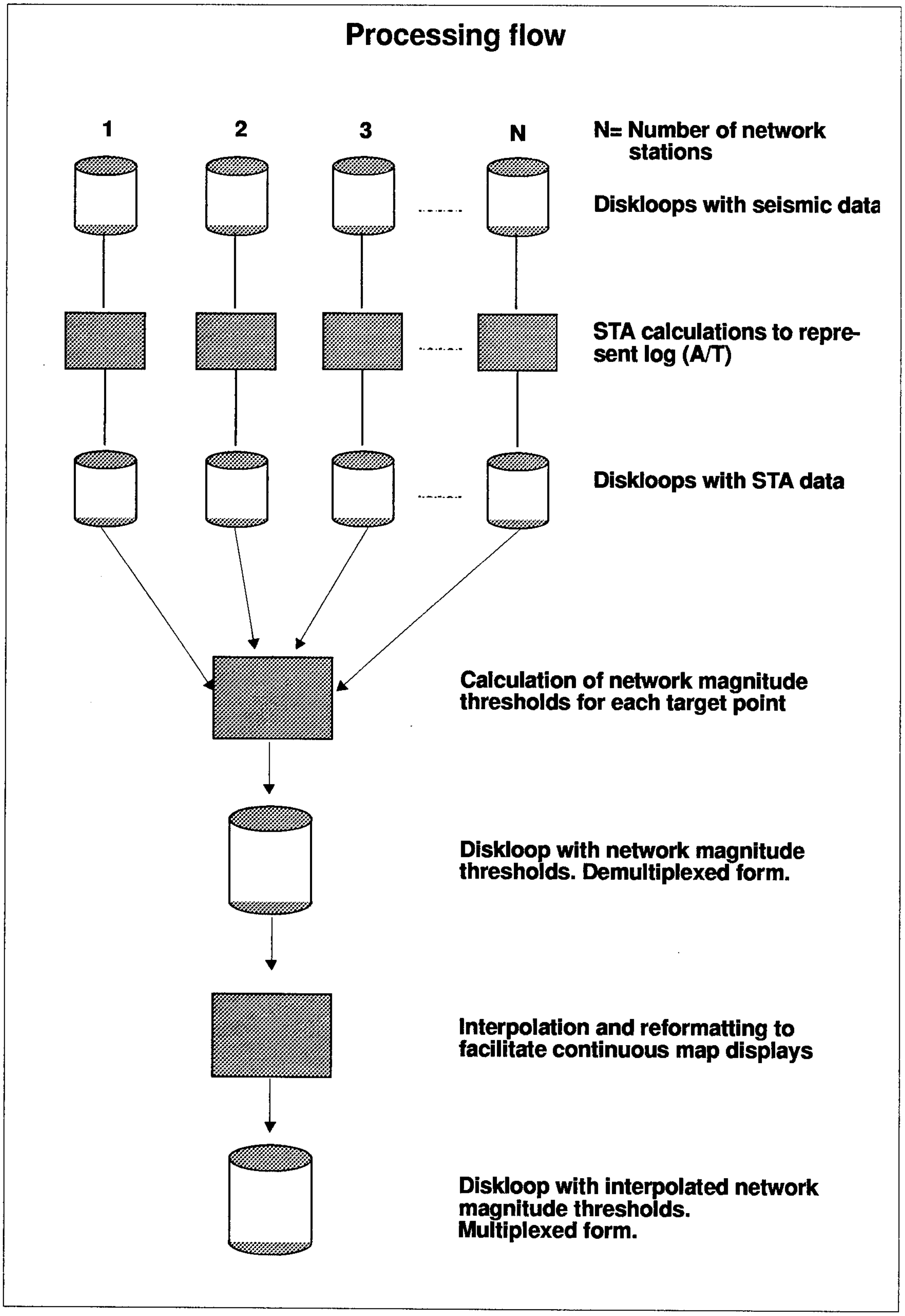

Fig. 7.1.1: Flowchart showing the structure of the continuous processing flow of the CSTM system

Interactive Analysis

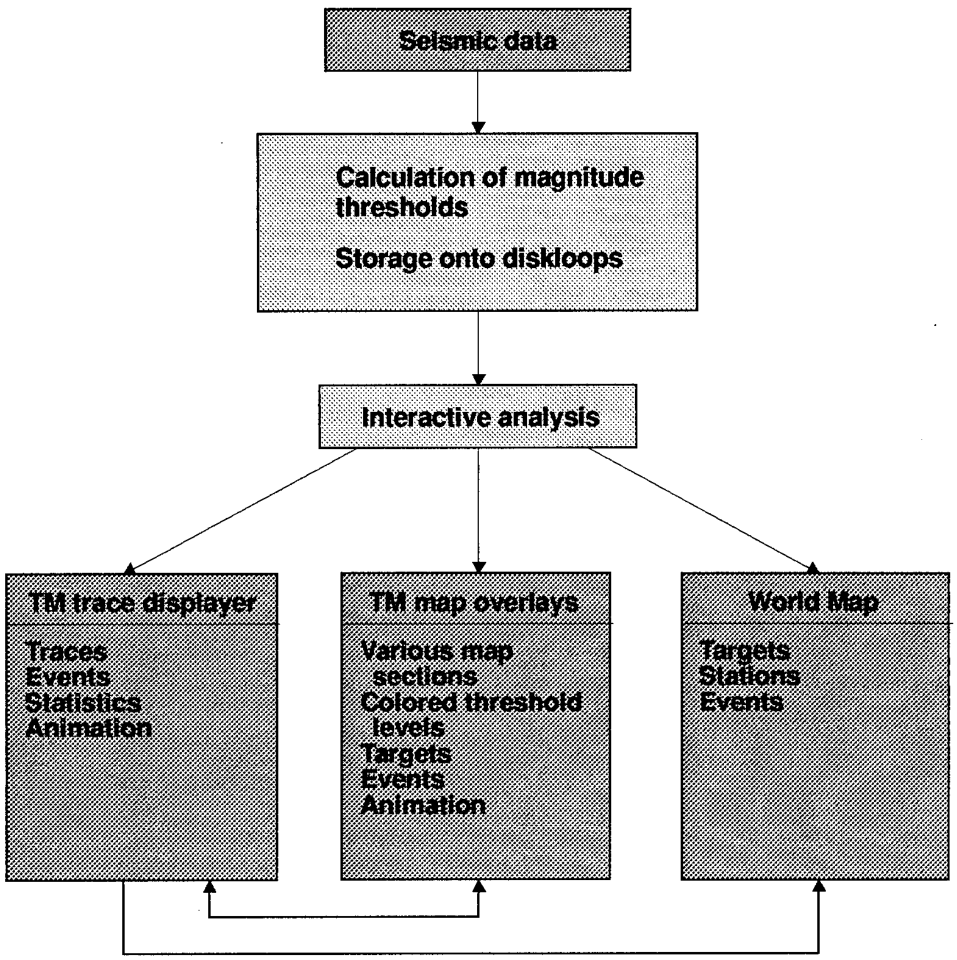

Fig. 7.1.2: Flowchart describing the functions of and interaction between the interactive modules of the CSTM system.

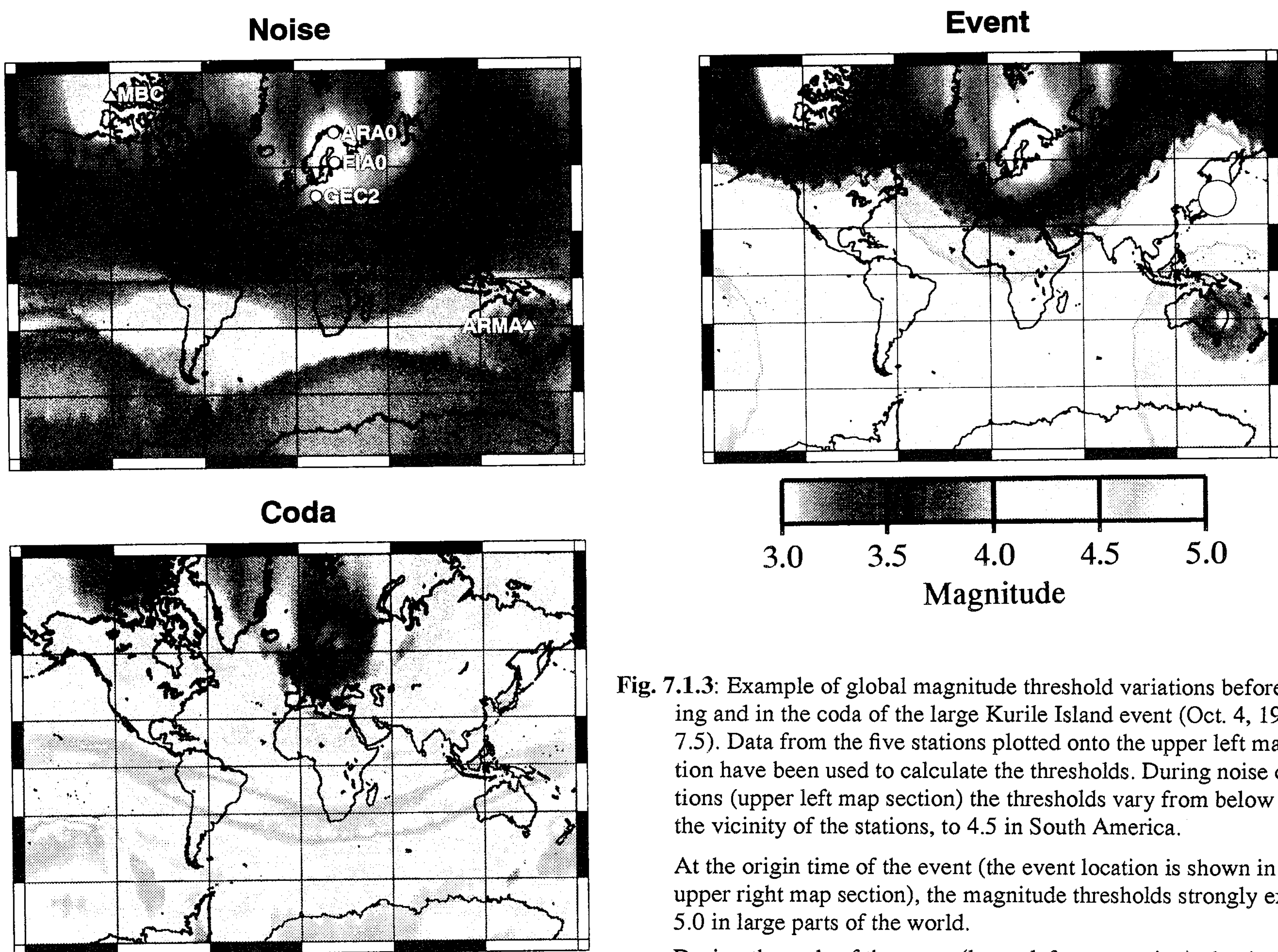

Fig. 7.1.3: Example of global magnitude threshold variations before, during and in the coda of the large Kurile Island event (Oct. 4, 1994, m_b 7.5). Data from the five stations plotted onto the upper left map section have been used to calculate the thresholds. During noise conditions (upper left map section) the thresholds vary from below 3.0 in the vicinity of the stations, to 4.5 in South America.

At the origin time of the event (the event location is shown in the upper right map section), the magnitude thresholds strongly exceed 5.0 in large parts of the world.

During the coda of the event (lower left map section), the thresholds start to fall back to normal (e.g., in Northern Europe).

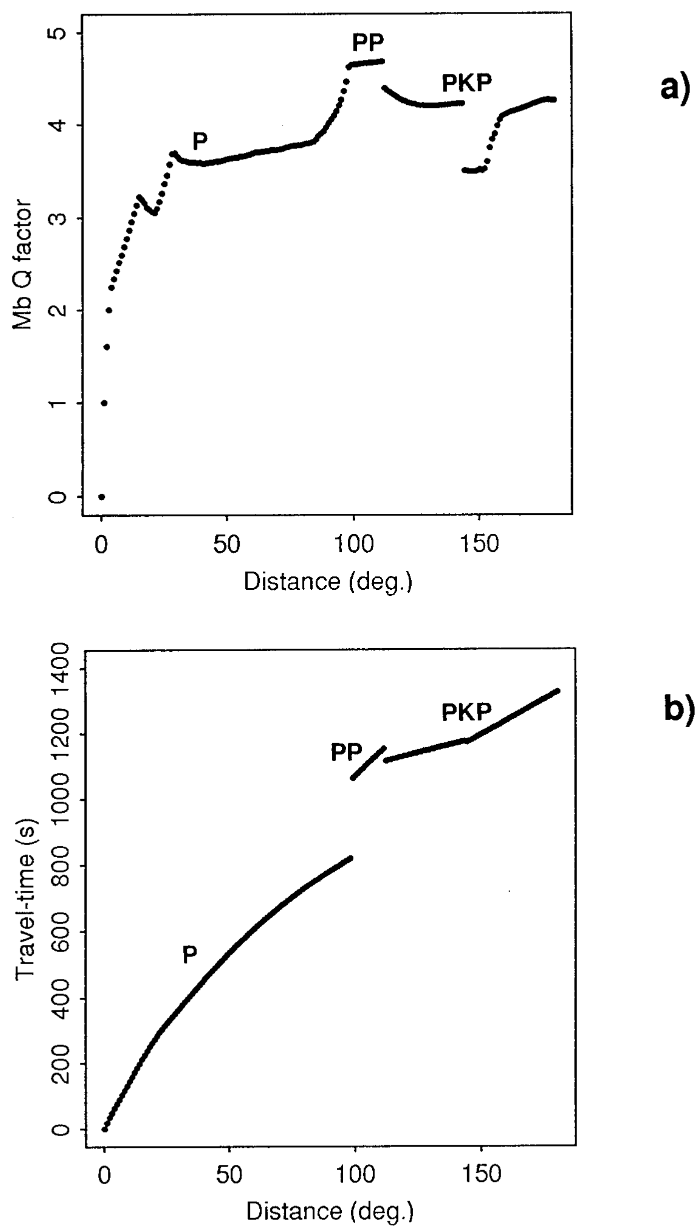

Fig. 7.1.4

a) Global m_b attenuation relations used to calculate the magnitude thresholds. Notice that relations for three different phases (P, PP and PKP) have been used to span the 0 - 180 degrees distance range.

b) Travel-times of the phases used for magnitude threshold calculations.

7.2 The Lop Nor nuclear explosions of 10 June and 7 October 1994

Introduction

This contribution describes observations made at our institution for the two Lop Nor nuclear explosions on 10 June and 7 October this year. Some comparisons are also made with the Lop Nor explosions conducted on 21 May 1992 and 5 October 1993.

The Lop Nor nuclear explosion of 10 June 1994

The explosion took place on 10 June 1994, with origin time 0626 GMT. Table 7.2.1 lists the basic parameters of the event as provided by various sources. The m_b magnitudes range from 5.68 to 5.84. The most accurate location is provided by the PDE bulletin, which uses a world-wide network for location purposes. The solutions by the Intelligent Monitoring System (IMS) (Bache et al, 1993), both automatic (IMS) and after analyst processing (ARS), are also listed. The NORSAR automatic and reprocessed solutions are included in the table. The NORSAR automatic detection/event processor output is shown in Fig. 7.2.1, whereas the plot associated with the reprocessed solution is shown in Fig. 7.2.2.

Figs. 7.2.3 and 7.2.4 show plots of the interactive IMS processing results. The trace plots of Fig. 7.2.4 are based on array beams for the four arrays FINESS, ARCESS, NORESS and GERESS, and a single channel (Z9, broad-band channel) for Apatity. The Spitsbergen array had a communication line problem at the time of this explosion.

Table 7.2.2 summarizes the automatic processing results for the six arrays. The NORESS, ARCESS and NORSAR arrays show outstanding SNR. The velocity/azimuth estimates are within the expected uncertainty for all arrays.

The Lop Nor nuclear explosion of 7 October 1994

The explosion took place on 7 October 1994, with origin time 0326 GMT. Table 7.2.3 lists the basic parameters of the event as provided by various sources. The m_b magnitudes range from 5.67 to 5.90. The most accurate location is again provided by the PDE bulletin, but the NORSAR Rerun solution is very close to the PDE solution. The solutions by the Intelligent Monitoring System, both automatic (IMS) and after analyst processing (ARS), are also listed. The NORSAR reprocessed solution is included in the table. The automatic NORSAR solution was wrong for this event. Although the EP-SigPro-estimated onset time and slowness for this event are precise, the event processing tried to associate coda detections, and in this case a bad coda detection was used for event definition.

Figs. 7.2.5 and 7.2.6 show plots of the interactive IMS processing results. The trace plots of Fig. 7.2.6 are based on array beams for the five arrays Apatity, ARCESS, NORESS, FINESS and GERESS, and a single channel (A0) for Spitsbergen.

Table 7.2.4 summarizes the automatic processing results for the six arrays. The NORESS array has the best signal-to-noise ratio (1231.1) for this event, and by extrapolation, this array would be expected to have a detectable signal for an event about 2.5 magnitude units lower.

Comparison with previous events

In the following we make a brief comparison between the two 1994 Lop Nor explosions dealt with above and the tests conducted at Lop Nor on 21 May 1992 and 5 October 1993.

Table 7.2.5 summarizes the PDE parameters for these four events. The 21 May 1992 explosion was significantly larger than the other three. The 1993 and 1994 explosions have very similar magnitudes, especially when estimated by IMS and the NORSAR array data. This similarity is illustrated in Fig. 7.2.7, which shows the NORESS P-wave recordings (A0Z seismometer) for the four events.

As seen in Tables 7.2.2 and 7.2.4, the NORESS STA/LTA values are, on the other hand, different by a factor of more than 2 for the two 1994 events, with the October event having the highest value. Since the signal amplitudes are very similar, this means that the NORESS noise level varied between the two 1994 events. The ARCESS STA/LTA values for the two 1994 events also differ by a factor of more than 2, but with the June event having the largest STA/LTA value. This finding is consistent with previous investigations about diurnal and seasonal noise variations at NORESS and ARCESS. These investigations have shown that NORESS is more exposed to cultural noise sources and also has an increased noise level during May-June due to snow melting. The June explosion occurred during working hours in Norway, while the October event occurred at 0426 a.m. local time in Norway. The STA/LTA variations for the other arrays are smaller.

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Reference

Bache, T.C., S.R. Bratt, H.J. Swanger, G.W. Beall and F.K. Dashiell (1993): Knowledge-based interpretation of seismic data in the Intelligent Monitoring System, *Bull. Seism. Soc. Am.*, 83, 1507-1526.

Ref.	Origin time	Lat	Lon	m_b
IMS (automatic)	06.26.13.2	42.242	87.940	5.68
ARS	06.25.55.1	41.220	89.928	5.68
NORSAR (automatic)	06.25.47.3	40.540	91.870	5.84
NORSAR Rerun	06.25.59.7	41.600	88.600	5.82
PDE	06.25.58.0	41.570	88.702	5.70

Table 7.2.1. Location estimates by various systems of the 10 Jun 1994 Lop Nor nuclear explosion. Two of the estimates were made automatically (indicated in the table).

Array	Onset time	Res	STA/LTA	Vel	Res	Azi	Res
NORESS	161:06.34.46.7	0.6	538.2	18.0	3.5	80.4	4.2
ARCESS	161:06.33.56.4	0.1	893.6	13.8	0.1	91.2	-6.0
GERESS	161:06.35.06.4	-0.3	95.9	15.3	2.0	66.4	-1.7
Apatity	161:06.33.31.0	0.4	57.2	11.1	-2.2	85.6	-16.9
FINESS	161:06.33.50.5	0.6	160.0	13.7	-0.1	90.5	1.8
NORSAR	161:06.34.47.0	0.6	333.3	14.7	0.2	77.1	0.9

Table 7.2.2. Automatic detection list for the Lop Nor nuclear explosion 10 June 1994. The columns show array name, automatic EP-SigPro onset time, onset residual relative to PDE origin time, maximum signal-to-noise ratio (STA/LTA), apparent velocity (km/sec), residual in km/sec, back-azimuth in degrees, back-azimuth residual. All residuals are relative to predictions using IASPEI91 tables and PDE origin time and location.

Ref.	Origin time	Lat	Lon	m_b
IMS (automatic)	03.26.10.2	42.070	88.336	5.67
ARS	03.25.55.3	41.018	89.500	5.67
NORSAR Rerun	03.25.59.3	41.600	88.600	5.79
PDE	03.25.57.8	41.574	88.680	5.90

Table 7.2.3. Location estimates by various systems of the 7 October 1994 Lop Nor nuclear explosion. Two of the estimates were made automatically (indicated in the table).

Array	Onset time	Res	STA/LTA	Vel	Res	Azi	Res
NORESS	280:03.34.46.1	1.1	1231.1	16.1	1.6	77.8	1.6
ARCESS	280:03.33.56.0	0.4	418.1	15.0	1.3	78.9	18.3
GERESS	280:03.35.06.1	-0.1	122.8	16.1	1.3	67.3	0.8
FINESS	280:03.33.50.2	0.8	218.4	14.0	0.4	80.2	8.5
Apatity	280:03.33.30.3	1.0	194.9	13.5	0.3	95.7	-6.8
Spitsbergen	280:03.34.25.3	0.1	97.4	7.8	-6.3	95.0	-1.9
NORSAR	280:03.34.46.7	1.1	277.5	14.7	0.2	75.9	-0.3

Table 7.2.4. Automatic detection list for the Lop Nor nuclear explosion 7 October 1994. The columns show array name, automatic EP-SigPro onset time, onset residual relative to PDE origin time, maximum signal-to-noise ratio (STA/LTA), apparent velocity (km/sec), residual in km/sec, back-azimuth in degrees, back-azimuth residual. All residuals are relative to predictions using IASPEI91 tables and PDE origin time and location.

Event	PDE parameters				IMS m_b	NORSAR Rerun m_b
	Origin time	Lat	Lon	m_b		
Lop Nor 92	21 May 92 04.59.57.5	41.604	88.813	6.5		
Lop Nor 93	05 Oct 93 01.59.56.5	41.647	88.681	5.9	5.65	5.83
Lop Nor 94a	10 Jun 94 06.25.58.0	41.570	88.702	5.7	5.68	5.82
Lop Nor 94b	07 Oct 94 03.25.57.8	41.574	88.680	5.9	5.67	5.79

Table 7.2.5. PDE parameters for four events discussed in the text.

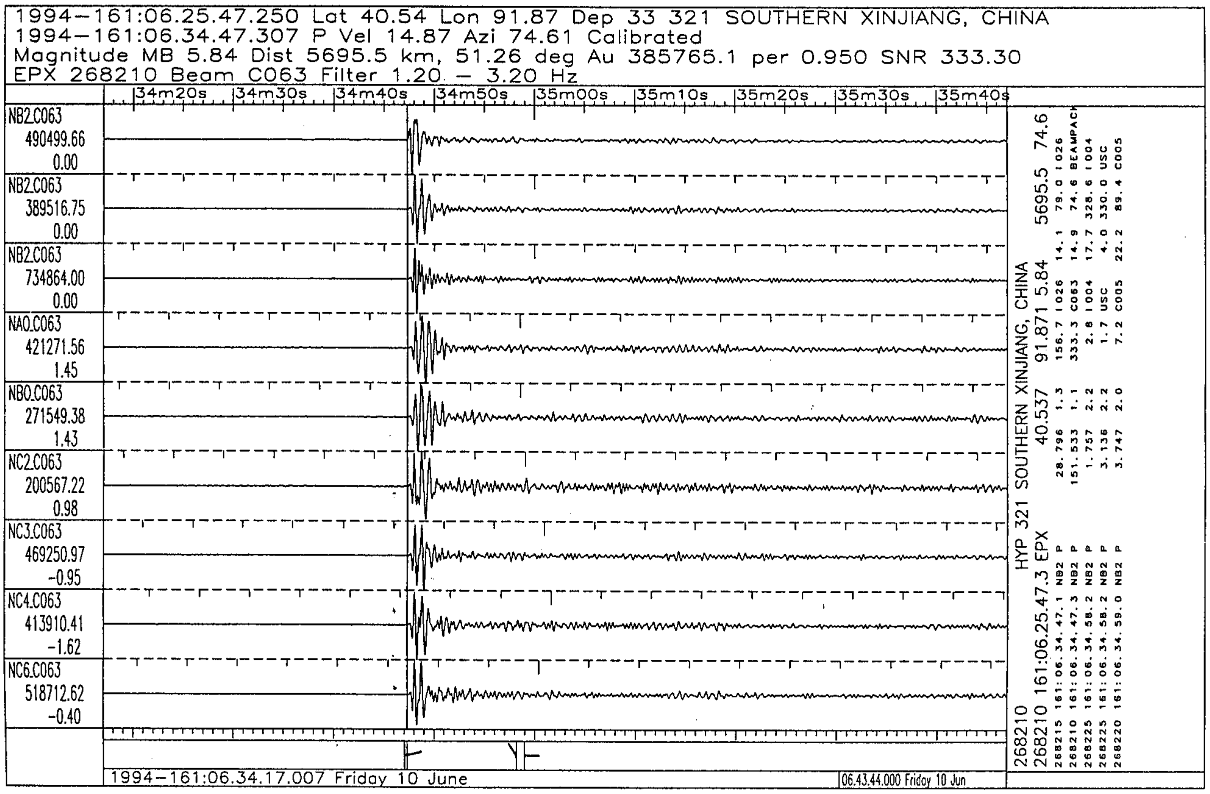

Fig. 7.2.1. Plot of the automatic NORSAR detection/event processor output for the Lop Nor nuclear explosion of 10 June 1994.

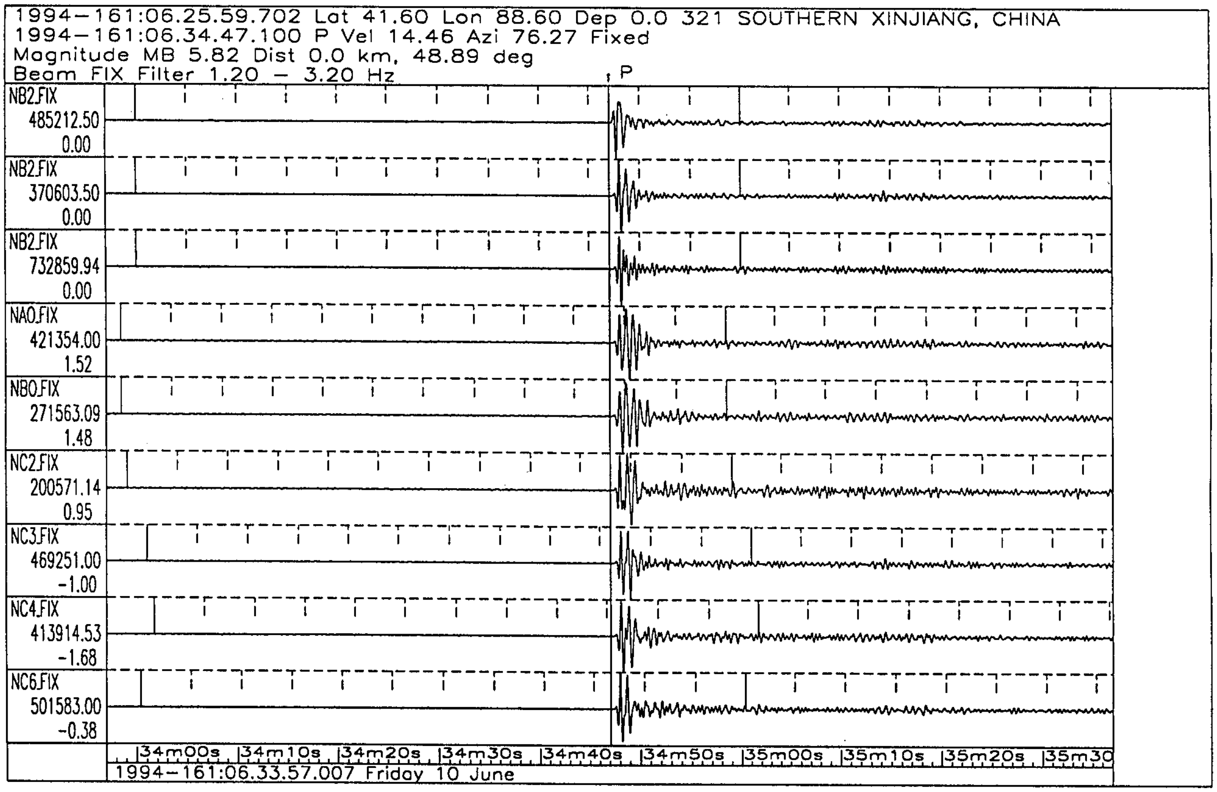

Fig. 7.2.2. Plot of the NORSAR reprocessed solution for the Lop Nor explosion of 10 June 1994.

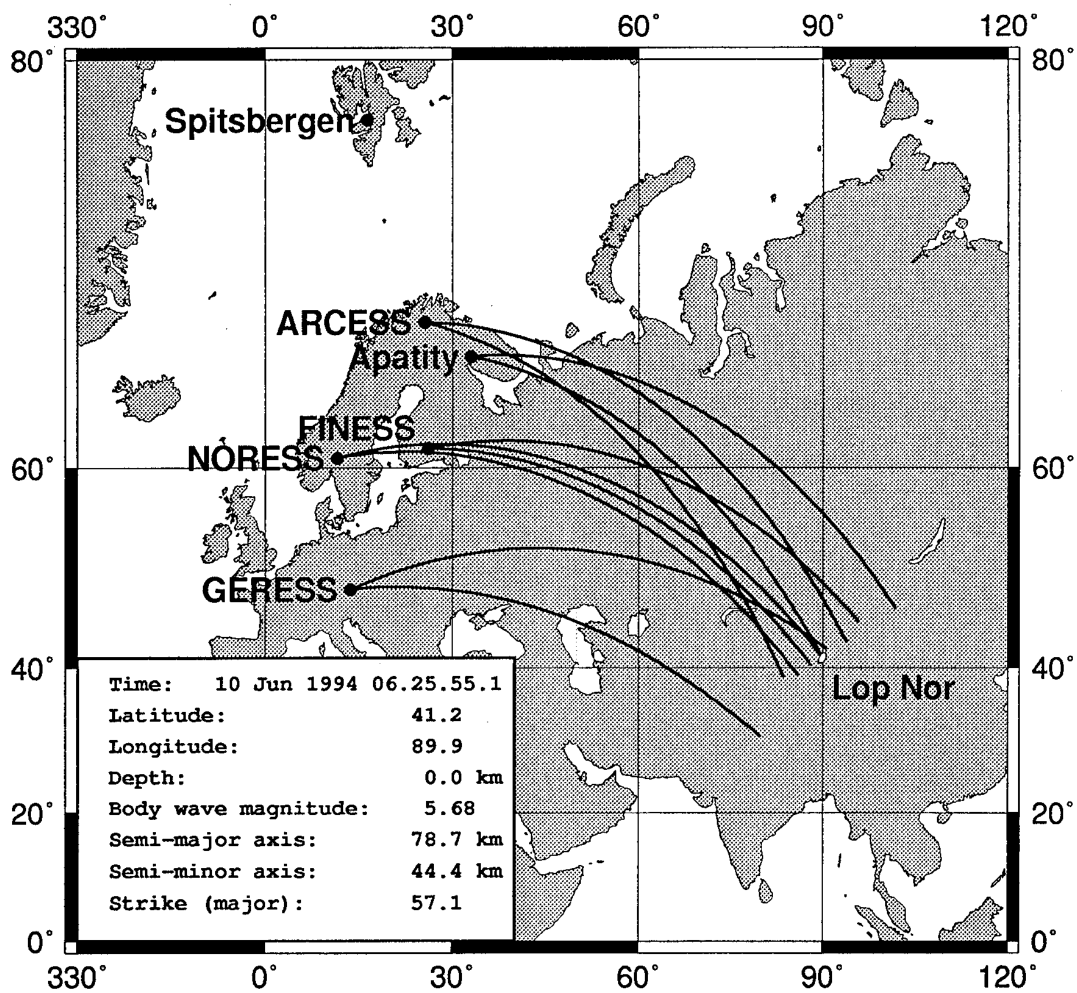

Fig. 7.2.3. Map showing the IMS solution (after analyst review) of the 10 June 1994 Lop Nor explosion. The great circle paths for the detecting arrays (based on P and PcP estimated azimuths) are also shown.

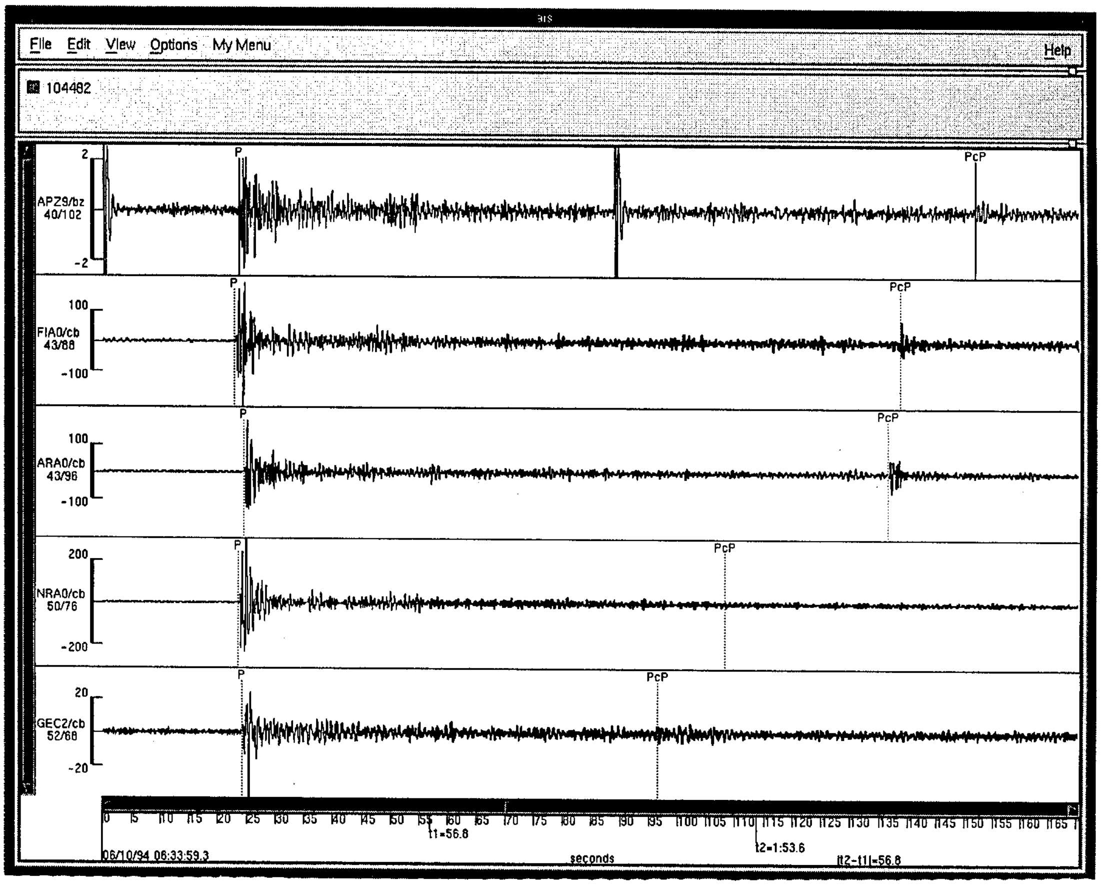

Fig. 7.2.4. P-phase waveforms of the 5 array traces (single sensor for Apatity, otherwise array beams) for the 10 June 1994 Lop Nor explosion.

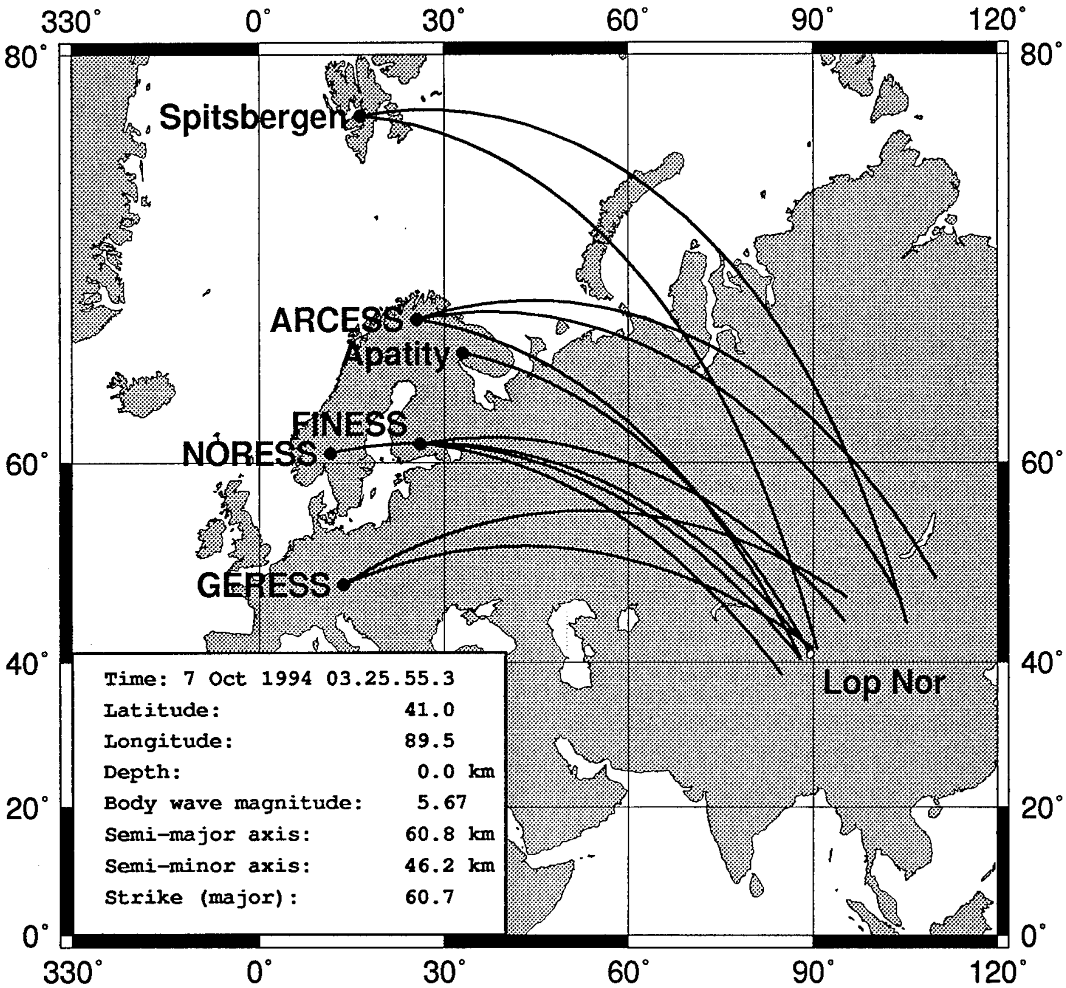

Fig. 7.2.5. Map showing the IMS solution (after analyst review) of the 7 October 1994 Lop Nor explosion. The great circle paths for the detecting arrays (based on P and PcP estimated azimuths) are also shown

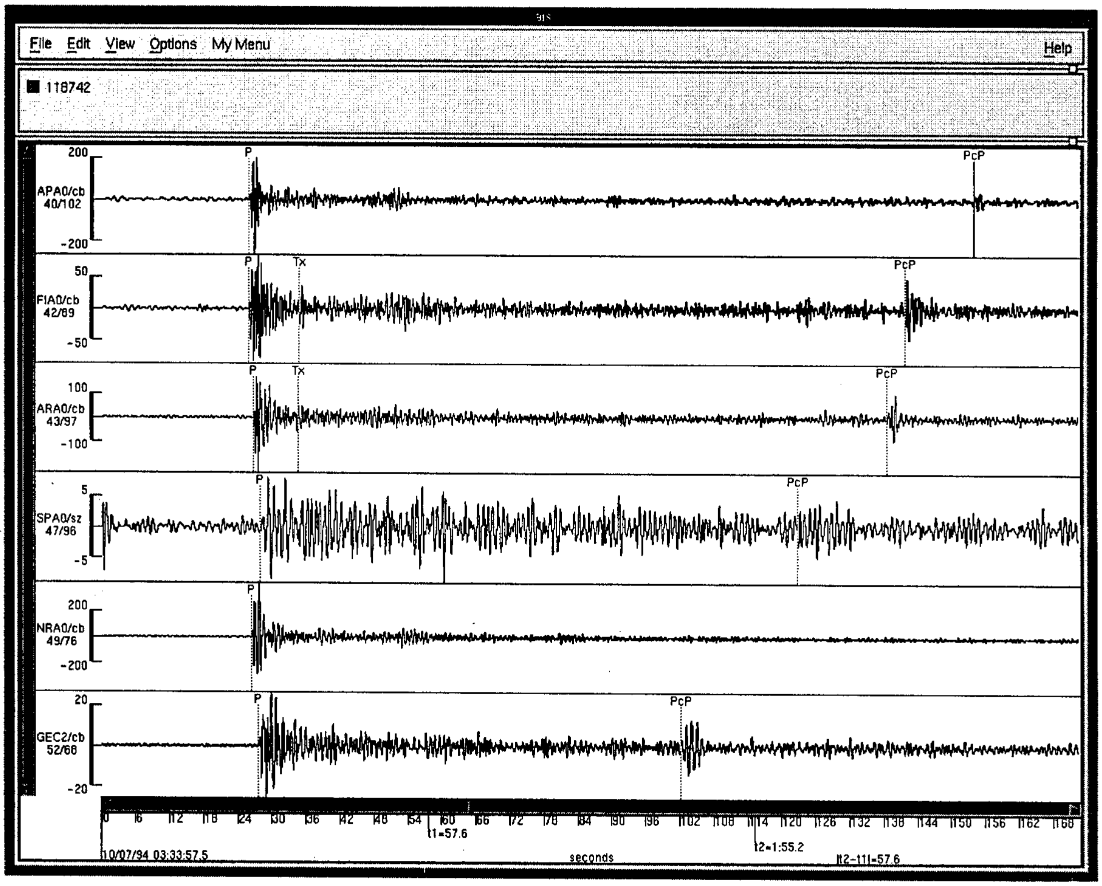

Fig. 7.2.6. P-phase waveforms of the six array traces (single sensor for Spitsbergen, otherwise array beams) for the 7 October 1994 Lop Nor explosion.

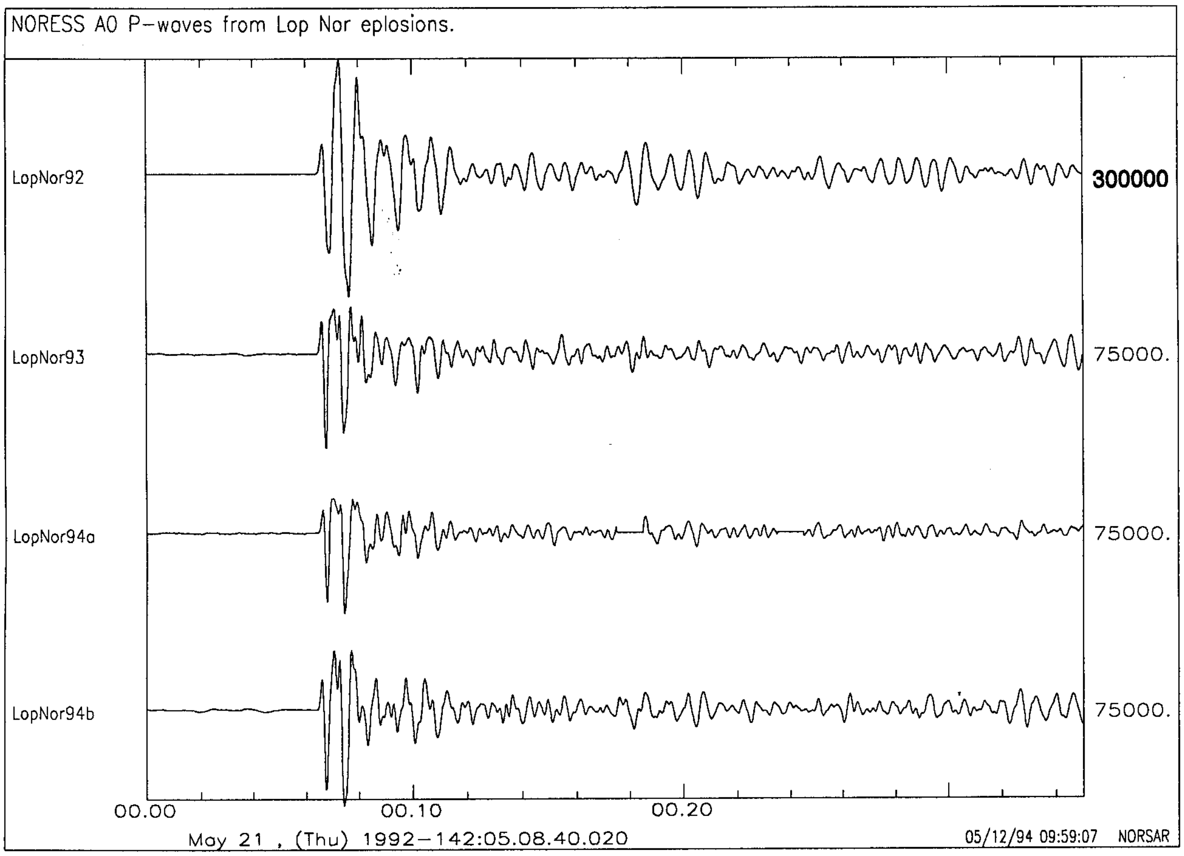

Fig. 7.2.7. NORESS P-waves (A0Z seismometer) for the four events discussed in the text. Note that the three lower traces are in the same scale, whereas the LopNor92 trace has a scaling factor that is different from the others. See Table 7.2.5 for magnitude estimates.

7.3 Combining NORSAR and NORESS processing

Introduction

The large aperture NORSAR array started operations in 1970 with 22 subarrays distributed over a diameter of 100 km. On October 1, 1976, the array was reduced to 7 subarrays with aperture about 60 km. Each subarray has 6 short period seismometers and the subarray aperture is about 8 km. During the years 1980-1981, experiments were performed with different subarray geometries to design a smaller array with good detection and location capabilities for local and regional events. As a consequence of this research, the NORESS array was constructed, and it became operational in 1984. The NORESS array has a diameter of 3 km and it is colocated with NORSAR subarray 06C. Figure 7.3.1 shows the geometry of the co-located arrays.

Throughout many years the NORSAR array has shown excellent detection and location capability. The analyst reviewed bulletin for the NORSAR array has been a significant contribution to the seismic community. The NORESS array has also shown very good detection capability for teleseismic events, as well as excellent detection and location capabilty for local and regional events. Moreover, automatic methods work very well for producing a bulletin of local and regional events. (Mykkeltveit and Bungum, 1984).

In this report we will demonstrate how to combine the two different processing techniques used for NORSAR and NORESS to improve the quality of an automatic teleseismic bulletin.

The method for detection of signals is identical for the two arrays. For slowness observations, f/k analysis can be used for the smaller array, due to the high correlation of the signals. For a large aparture array f/k analysis without time corrections does not work, and a beamforming (beampacking) method is used for slowness observation. (See NORSAR Sci. Rep. No 2-93/94).

In automatic detection procedures, many uninteresting signals are usually detected. For the NORESS array, it turns out that the f/k method normally gives apparent velocity values that are lower than Rg phase velocities for such detections, and these detections can therefor be classified as "noise detections", and do not represent real seismic phases from local, regional or teleseismic events. For the NORSAR array, the automatic method is based on a teleseimic beam deployment, and consequently always gives a resulting teleseismic slowness both for non-seismic disturbances and for local events.

An automatically produced bulletin of teleseismic events by this method is therefore less reliable than a corresponding local/regional automatic procedure using NORESS.

In the report mentioned earlier we discussed additional methods based on the NORSAR array alone to identify local events. In this report we will consider methods where NORESS automatic results are used to try to automatically identify false events in the automatic NORSAR bulletin.

NORESS automatic bulletin

An automatic NORESS bulletin with local and regional events is produced using the "EP_Ronapp" process (Fyen, 1987, 1989). For each event in the NORESS bulletin, we can predict arrivals in the NORSAR array. A simple rule is for each event to pick the first P-phase and the last S-phase arrival time and then define this as a time window. We then extend each end of the window with 20 seconds. For each such time window, we inspect the NORSAR detection list, and mark each phase arrival within the list as a potential local/regional phase.

In addition to definition of local/regional events, the NORESS automatic bulletin identifies teleseismic phase arrivals. A related issue is therefore to investigate the potential for using a NORESS defined teleseismic phase as basis for beamforming of the NORSAR and NORESS array. Another interesting aspect is to try to enhance a NORSAR defined teleseismic location by including NORESS in the process.

Data analysis

For selected data days during the period 4 August - 18 September 1994, we carefully inspected the automatic and reviewed bulletin for the NORSAR array together with the automatic bulletin for the NORESS array.

NORSAR events that the analyst do not include in the reviewed bulletin are routinely classified into the three classes 1) probable local event, 2) clear spike or non-seismic noise on one or more subarrays, and 3) ambigous event with low SNR or secondary teleseismic phase.

By comparing the automatic NORESS bulletin with the automatic NORSAR bulletin, we "masked" all probable local/regional phases, using the simple time window rule defined above. Then we calculated statistics on:

- 1a) How many NORSAR defined events are correctly masked as probable local?
- 1b) How many NORSAR defined events are in-correctly masked as probable local?
- 1c) How many NORSAR defined events that are probably local are not masked?

In addition we looked at NORESS defined teleseismic phases and counted:

- 2a) How many are connected with NORSAR-defined teleseismic events?
- 2b) How many are not connected with NORSAR-defined teleseismic events?
- 2c) How many NORSAR teleseismic events are not connected with NORESS teleseismic phases?

Results

Table 7.3.1 shows the results of the bulletin analysis. We see that 36% of the automatically defined events are accepted as teleseismic events by the analyst. The remaining 64% of the events are either due to triggering from local disturbances within one subarray, or due to bad data conditions (spikes), or due to real local/regional events (but falsely detected as teleseismic by the automatic process).

64% of the local events are correctly identified by this simple masking rule, using the NORESS automatic bulletin. In this analysis we have not counted events where the Lg phase alone has been detected by NORESS. Only events that have been formed by association of a Pn/Pg phase and an Sn/Lg phase at NORESS have been used.

By combining the identified local events and the confirmed teleseismic events, we find that 42% of the NORSAR automatic detetcions are correctly classified. The remaining detections are mostly of low SNR or "spike" detections.

The analysis shows that 64% of the local events falsely reported as teleseismic events by the NORSAR automatic processor, can by masked automatically by inspecting the NORESS automatic bulletin.

Two real teleseismic events are masked out by this method. Both were in the coda of regional events.

75% of the real teleseismic events reported by NORSAR are also confirmed as such by the NORESS array. Thus, by combining NORESS and NORSAR defined teleseismic events, 75% of the NORSAR events can be confirmed automatically.

In addition, NORESS reports a significant number of teleseismic phases that are not detected with the current NORSAR beam deployment. This indicates a significant potential for improvement both by adjusting the NORSAR time delay corrections and by joint NORSAR/NORESS processing.

Conclusions

This study has shown that a clear improvement in the automatic NORSAR processing can be achieved by combining NORSAR and NORESS. By a simple masking algorithm, most of the NORSAR detected local and regional events can be identified as such using NORESS data. Furthermore, NORESS complements NORSAR by giving an "independent" confirmation of the majority of teleseismic phases. Even further improvements might be possible by joint beamforming techniques, although this has not been attempted in this study.

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Day # 1994	1A Local Masked	1B Local Error	1C Local NRS miss	2A NRS Tele OK	2B NRS Tele -	2C NB2 Tele	3A NB2 Accepted	3B NB2 Low SNR	3C NB2 False	Number EPX
209										
216	9	1	3	10	2	3	14	7	2	35
219	0	0	0	8	4	2	10	1	1	12
225	0	0	0	9	4	2	11	10	2	23
228	9	0	5	14	3	5	19	1	9	43
234	7	0	5	15	3	1	16	3	8	39
237	0	0	15	6	2	3	9	2	9	35
243	16	0	2	7	3	2	9	1	14	42
253	1	0	0	4	4	3	7	1	8	17
255	9	0	4	11	0	3	14	4	3	34
256	9	0	0	11	3	1	12	5	5	31
257	9	0	3	5	1	0	5	7	10	34
258	0	0	1	5	4	3	8	8	6	23
259	3	0	0	3	2	2	5	14	3	25
260	4	0	0	7	0	3	10	10	3	27
261	1	0	0	8	2	2	10	3	4	18
264	4	0	3	4	6	6	9	4	6	26
265	1	1	5	5	2	3	8	3	13	30
267	2	0	1	5	8	0	5	8	6	22
269	5	0	2	2	3	2	4	7	5	23
Sum	89	2	49	139	56	46	185	99	117	539

1A	NORSAR defined events correctly marked as local	64.5% of local events
1B	NORSAR accepted events that are in-correctly marked as probable local	1.1% of accepted events
1C	NORSAR defined events that are probable local, but not marked as such	35.5% of local events
2A	NORESS teleseismic phases connected with NORSAR accepted events	75.1% of accepted events
2B	NORESS teleseismic phases that are not connected with NORSAR accepted events	30.3% of accepted events
2C	NORSAR accepted events not connected with NORESS teleseismic phases	24.9% of accepted events
3A	Total number of NORSAR accepted events	34.3% of all NORSAR events
3B	Number of NORSAR defined events not reported due to low SNR or secondary phases	18.4% of all NORSAR events
3C	Number of false NORSAR defined events due to noisy subarray(s) or spikes	21.7% of all NORSAR events
	Percentage of events that are correctly classified by combining NORESS and NORSAR	42.3% of all NORSAR events

Table 7.3.1. Results of the bulletin analysis.

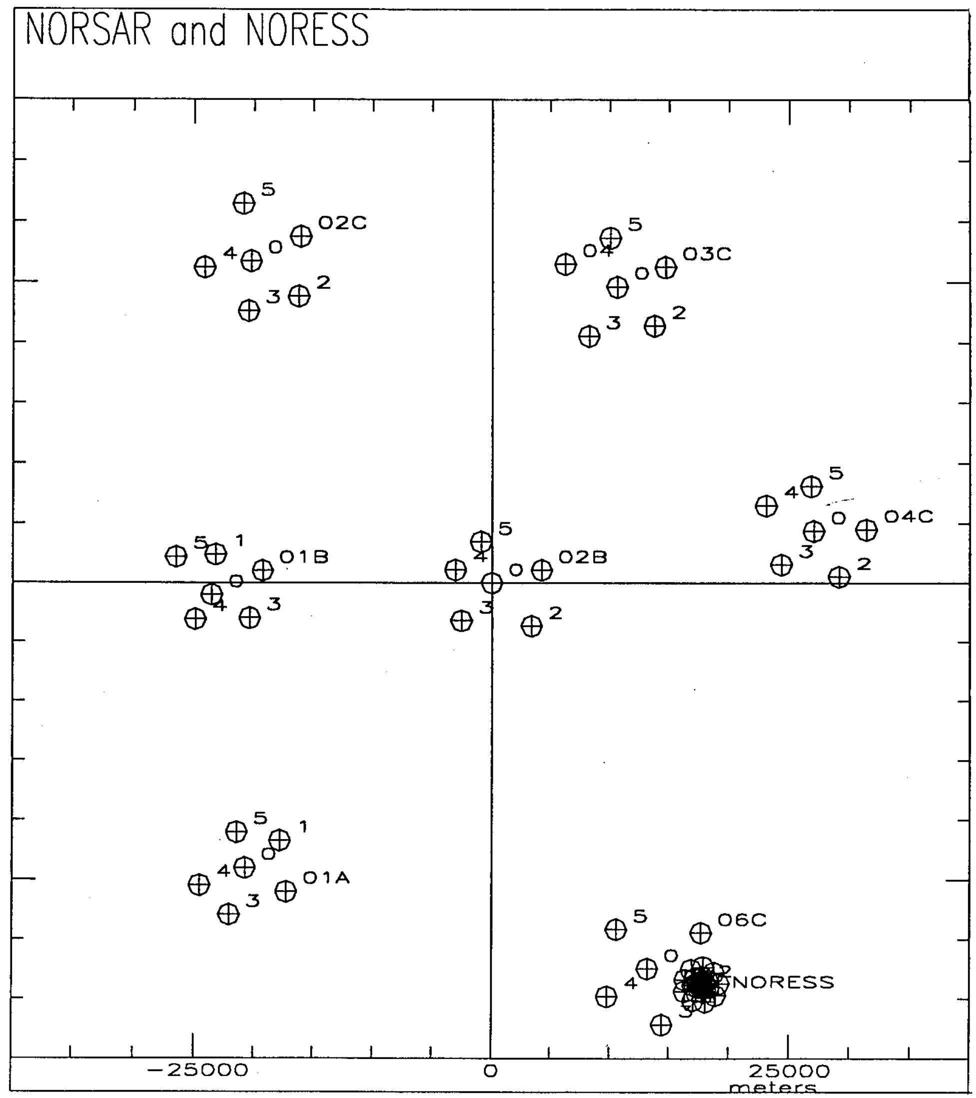

Fig. 7.3.1 The NORSAR and NORESS arrays.

7.4 Epicenter location and cratering at the Novaya Zemlya underground nuclear test site

In 1989 the Norwegian Institute of International Affairs (NUPI) started a satellite study of the northern underground nuclear test area on Novaya Zemlya. Results from this study were published in Skorve and Skogan (1992). Early in this work, using Landsat TM images, one craterlike feature was found close to the southwestern mountain slopes of the Matochkin Shar Strait. SPOT panchromatic 10 m resolution images were purchased, and these revealed three features, most probably craters that were created by underground nuclear explosions. This was unexpectedly confirmed when German aerial photographs of the Matochkin Shar from the summer of 1942 became available. The craters did not show up on these and thus proved that they were formed sometime after 1942. Fig. 7.4.1 is a spot photo from 1989 of the test area, showing the three craters. The aerial photo taken in 1942 is shown in Fig. 7.4.2.

The craters are lined up in a row approximately parallel to the Matochkin Shar coast. The northernmost crater ("N" in Fig. 7.4.1) is very well defined, being nearly circular and about 100 m in diameter. The middle one ("M" in Fig. 7.4.1) is by far the largest and appears roughly elliptical, measuring about 220 x 270 m. The reason for its irregular shape is probably that the epicenter is very close to the crest of the steep mountain slope down toward the Matochkin Shar coast. Following the underground explosion, parts of the mountain above the detonation center, big blocks of rock and boulders, slid down the slope. The crater to the south ("S" in Fig. 7.4.1) is about 75 m in diameter and is situated on a quite level mountain slope, not steep, facing the Shumilikha river. The obvious question was which underground explosions created these three craters. To check this, we plotted the locations of underground nuclear explosions on a map of the area. For underground tests made before the TTBT-agreement became effective in 1976, the epicenter locations were taken from Lilwall and Marshall (1986), while for the later ones, NORSAR provided the data. However, the uncertainty involved proved to be too large to make it possible to connect the craters to specific underground nuclear explosions in that area.

The Joint Epicenter Determination (JED) method, described in Lilwall and Marshall (1986) paper, that was used to improve location of epicenters, attracted our attention. The JED-method requires that at least one of the epicenters in the test area be restrained to predetermined values. The difficulty on Novaya Zemlya is that there is no information on true locations. The explosion on 29 September 1976 (event 14 in Lilwall and Marshall (1986)) was chosen as the constrained epicenter for the northern test site. It is well recorded and centrally placed with respect to the distribution of epicenters. Since the true location of event 14, "the origo point", is also uncertain, we thought the location of the craters found close to the Matochkin Shar could be used as new constrained epicenters for the northern test site to obtain more accurate location of the underground nuclear explosions on Novaya Zemlya. Two requirements have then to be met: determination of the exact coordinates of the crater centers and identification of which explosions caused the formation of the three craters. As mentioned earlier, the seismic location is too inaccurate to relate specific epicenters to the three craters. However, some time after the NUPI study (Skorve and Skogan, 1992) was published in 1992, collateral information emerged with information on which specific nuclear explosions caused the formation of the three craters. Additional

information is found in Matzko (1993), as it contains data on scaled depth of burial (SDOB) for the underground nuclear explosions on Novaya Zemlya. For all the three explosions that caused the formation of craters, SDOB was 90 m according to Matzko (1993).

The approximate depth of explosion can be calculated from the formula: $D = mY^{1/3}$, where D = approximate depth of explosion in meters, m = the scale depth in meters (=90 m) and Y = yield in kilotons (TNT equivalent). Measurements and calculated data on the Novaya Zemlya craters and their associated explosions are collected in Table 7.4.1. The yields given in this table are from Matzko (1993).

The location of the crater centers on SPOT satellite images can be measured with an accuracy of 2-3 pixels (20-30 meters). Unfortunately, it is presently not possible to transform this to the same degree of cartographical accuracy. This is due to the total lack of good topographical maps of the Matochkin Shar area. The best available map is at the scale of 1:500,000, which is clearly inadequate.

One alternative way to improve the geographical location of the craters is now being tried. The method uses the pixel and line coordinates measured on SPOT satellite images combined with ancillary data that is available on the leaderfile on SPOT digital data tapes. These are measurements made during the imaging process and include satellite position, satellite velocity, satellite attitude velocity, look angle of the imaging instrument and observation time.

Three digital SPOT scenes of the Novaya Zemlya northern underground nuclear test site were purchased. The pixel and line coordinates of the crater centers were measured for each of the SPOT scenes. The three separate sets of measurements were combined with their associated ancillary SPOT data. This procedure is illustrated for two of the SPOT scenes in Figs. 7.4.3 and 7.4.4. The preliminary results of geographical coordinate determination using this method are presented in Table 7.4.2.

The pixel/line measurements were made by Masahiro Etaya of TRIC, Tokyo, and Johnny Skorve, NUPI, while calculation of the crater center coordinates was made by Pål Bjerke, researcher at the Norwegian Defence Establishment (NDRE). The crater center coordinates can be derived by calculating the middle values of the three data sets.

The average inaccuracy of SPOT in this context is about 500 m and relates to uncertainties in satellite position and the look angle of the imaging instrument. Additional inaccuracy is added to this by the perspective effect when doing off-nadir imaging. The size of the effect is determined by the off-nadir look angle and the attitude above the sea level of the area or spot of interest.

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Matzko, J.R. (1993): Physical environment of the underground nuclear test site on Novaya Zemlya, Russia. USGS Open-File Rep. 93-501, Reston, VA, USA.

Skorve, J. and J.K. Skogan (1992): The NUPI Satellite Study of the Northern Underground Nuclear Test Area on Novaya Zemlya. NUPI Research Rep. No. 165, Oslo, Norway.

Crater	Approximate Dimension	Date of Detonation	Approximate Yield of Explosion	Approximate Depth of Explosion
Northern	Circular Diam.=100 m	28 Aug 1972	330 kt	620 m
Middle	Irregular 220x270 m	21 Oct 1967	95 kt	410 m
Southern	Nearly Circular Diam.=70 m	27 Oct 1966	420 kt	680 m

Table 7.4.1. Measurements and calculated data for the explosions associated with three craters described in the text. The approximate depth of explosion is calculated from the scaled depth of burial and yields given in Matzko (1993).

Crater	Pixel No.	Line No.	Crater Center Location	
SPOT Image 24 August 1989				
Northern	2263	1363	54:50:56 40 8146334	73:23:58 431423
Middle	2257	1425	54:50:08 40 8145892	73:23:45 450982
Southern	2230	1518	54:48:40 40 8245343	73:23:26 430176
SPOT Image 29 July 1990				
Northern	5031	4794	54:50:26 40 8146433	73:24:82 431157
Middle	5024	4854	54:49:42 40 8145978	73:23:47 430757
Southern	4989	4945	54:48:15 40 8145425	73:23:28 429948
SPOT Image 17 August 1992				
Northern	1861	3247	54:52:21 40 8145085	73:23:20 432127
Middle	1860	3309	54:51:36 40 8144624	73:23:05 431712
Southern	1831	3401	54:50:03 40 8144127	73:22:48 430874

Table 7.4.2. Crater center locations for the three craters described in the text. The coordinates are estimated from three SPOT scenes, from 1989, 1990 and 1992, respectively. The crater locations are given in geographical coordinates (degrees: minutes : seconds) and in the Universal Transverse Mercator (UTM) grid.

Fig. 7.4.1. This enlargement of a SPOT photo taken in August of 1989 covers the Matochkin Shar strait of Novaya Zemlya from the Shumlikha delta and about 8 km northeastward. The Severny Base is seen in the middle of the lower part of the picture. The craters found on this picture (denoted "N" for northern, "M" for middle, and "S" for southern) are seen as white or partly white spots because of snow left inside their boundaries. (PHOTO: SPOT IMAGE; IMAGE PRODUCTION: TRIC: TOKYO)

Fig. 7.4.2. The area shown on this mosaic of two Luftwaffe aerial photos from 1942 is the same as that of Fig. 7.4.1. There is no trace of the three craters seen on Fig. 7.4.1. (PHOTOS: GERMAN LUFTWAFFE)

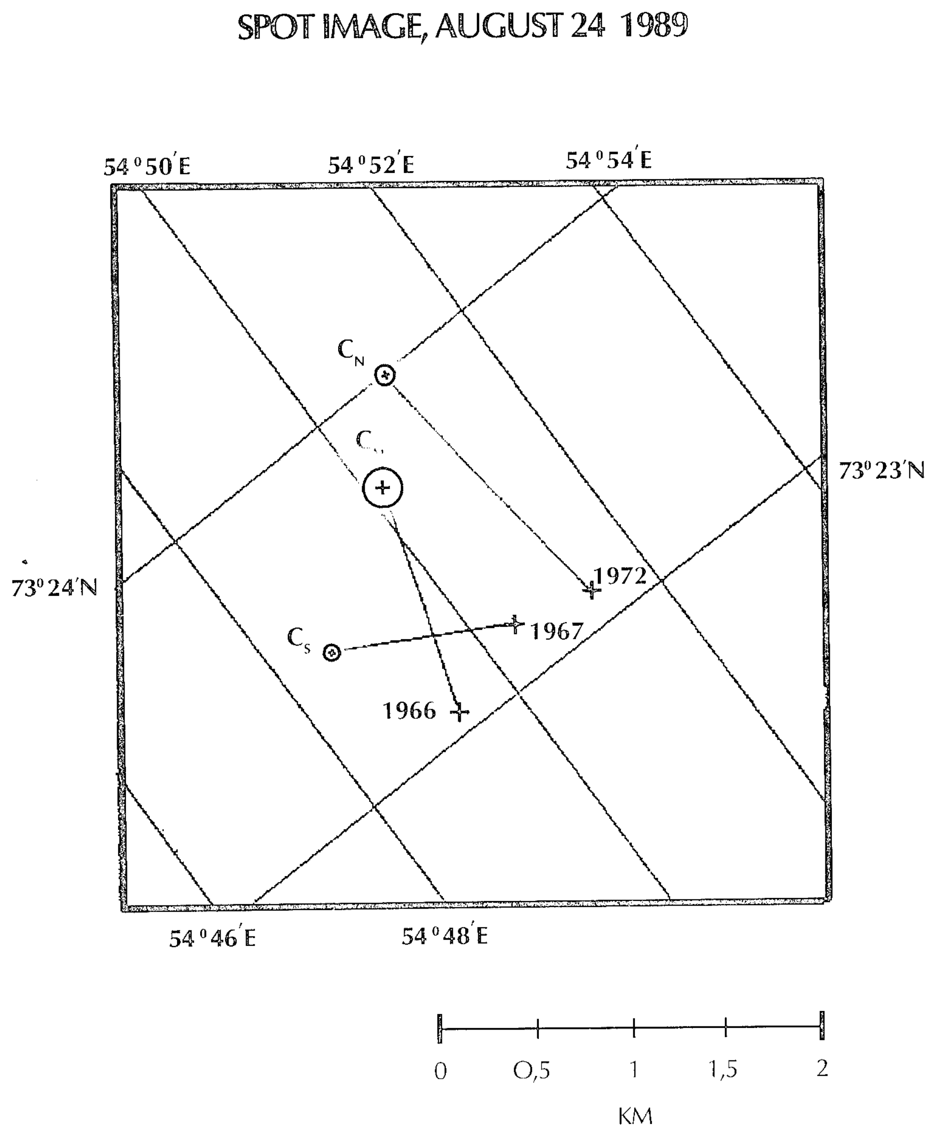

Fig. 7.4.3. Crater center locations based on the SPOT scene from 24 August 1989. The position of the coordinate grid is based on ancillary data available on the SPOT digital data tape, as explained in the text. The epicenters of the associated explosions are from Lilwall and Marshall (1986). Note that the southernmost epicenter location (1966) does not correspond to the southernmost crater.

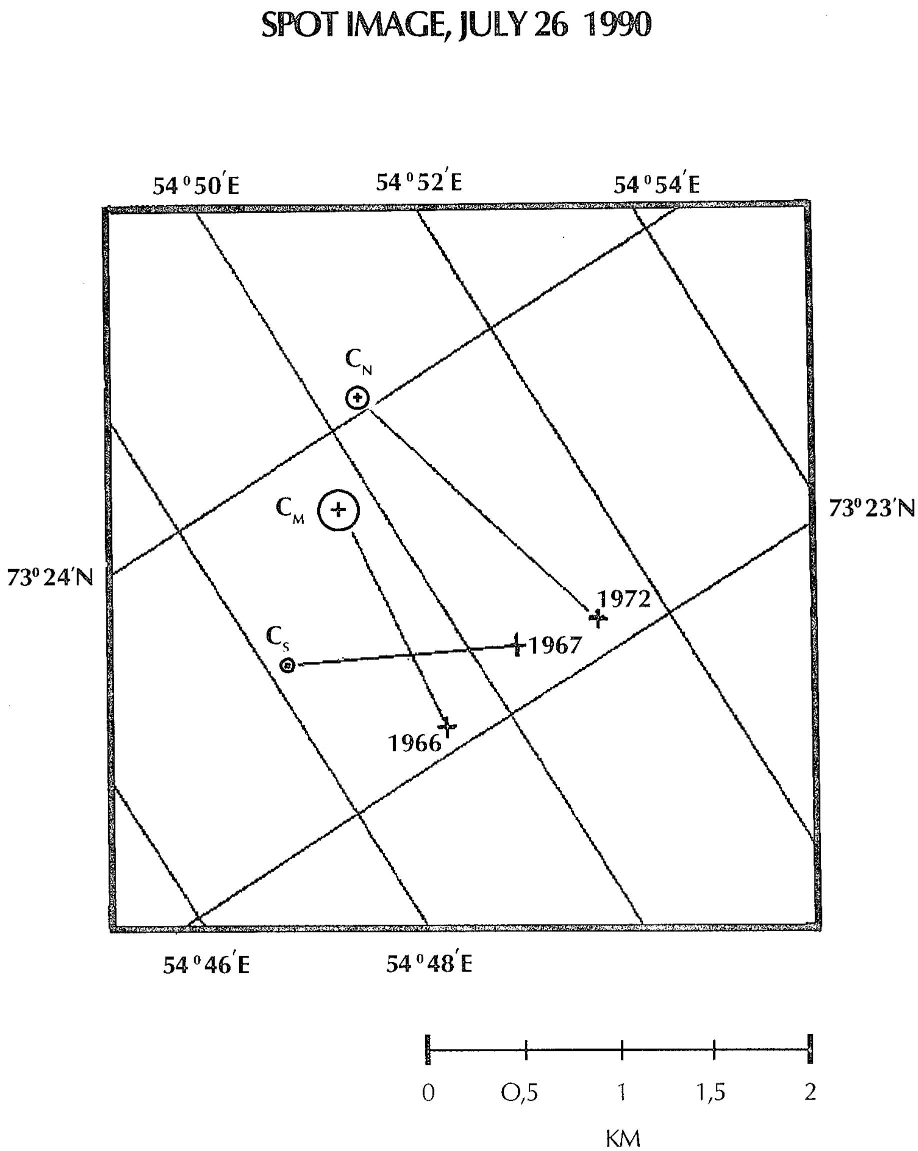

Fig. 7.4.4. Same as Fig. 7.4.3, but here based on the SPOT scene from 26 July 1990.

7.5 Mislocation vectors for small aperture arrays - a first step towards calibrating GSETT-3 stations

Introduction

At NORSAR small aperture arrays have been used for many years to locate seismic events either with onsets at single arrays or with a common interpretation of detections from all available arrays. In this context automatically calculated ray parameter and azimuth values play an important role. It is well known that some observed data show systematic deviations from theoretically expected values, and it is also well known that single data from known source regions show a large scatter. Whatever the reason is for these deviations, they influence the quality of all event locations based on automatically estimated parameters. In this study the phrase "slowness" is always used for the total length of the slowness vector derived from ray parameter and azimuth. Estimation of systematic slowness deviations and statistical information about the scatter of individually measured slowness values are part of the generally needed calibration of all seismic stations of the GSETT-3 network to correct the input to the location procedures. Therefore the data base of all detected phases from all six small aperture arrays for which data are recorded and processed at NORSAR, was investigated to search for systematic patterns in slowness deviations.

Data bases used

At NORSAR the earliest automatically estimated fk-results are available since Jan 1, 1989. To obtain deviations from theoretically expected values a list of reference events is needed. Therefore such a list was compiled for the time period Jan 1, 1989 to June 30, 1994, which was chosen as the end time of this study. Main sources for this list were the bulletins of ISC and PDE. But because these bulletins are not complete for all observable smaller events in Europe, the following local and regional catalogues from Europe were added: for Scandinavia the bulletins of the Seismological Institutes in Helsinki and Bergen, a list of confirmed quarry blasts from the Kola peninsula, for Central Europe a local Bulletin of the Vogtland / Western Bohemian region of earthquake swarms, a list of precisely located events from the Polish mining areas, and a list of confirmed quarry blasts in Bavaria / Germany and in the Czech Republic (for details see Table 7.5.1). All these event lists were merged together, and double entries were carefully eliminated. Table 7.5.1 also gives information about the amount of contributions from each source to the final list of 157 825 reference events.

For all these events, their theoretical onset times as well as predicted slowness values were calculated and compared with automatically estimated values from detections at the arrays investigated. The availability of the fk-results is not the same for all arrays and reflects mostly the successive extension of the European array network (Table 7.5.2).

Association of observed onsets with theoretically estimated onsets

To get reliable mislocation vectors the association criteria must be carefully defined. In this study the following procedure was chosen:

a) For each event in the list of reference events azimuth and distance were calculated with respect to the observing arrays.

b) To get an optimum coverage of the slowness space it is of interest to compare all theoretical arrivals with detected onsets. Using distance, depth, and event origin time, the absolute onset times of all seismic phases as included in the IASP91 tables (Kennett and Engdahl, 1991) were calculated for all arrays considered. To reduce the number of erroneous associations some restrictions related to epicentral distance and event magnitude were introduced, some secondary onsets were only associated if an earlier phase of the same event was also associable, and additionally, all theoretical phases to be considered for comparison with observed ones must be separated in time by at least 3 seconds. The list of used phases with the restrictions that apply is given in Table 7.5.3.

c) These list of onsets for every event was then compared with detections and SigPro-results for each array. For GERESS, the SigPro-results from the processing in Bochum since November 9, 1990 were used instead of the results at NORSAR because of completeness and data quality. To define a theoretically expected phase as observed the residual between detected and theoretically estimated onset time must be less than 10 seconds and the absolute slowness residual must be less than 10 s/deg. In the case of more than one detection in this time interval of +/- 10 seconds around the theoretical onset, the onset with the smallest travel time residual and an acceptable slowness residual was associated. Sometimes, onsets of two or more events have approximately the same arrival time at a seismic station and the list of associations had to be checked for such situations. In such cases all associations were discarded from further use.

d) In a final step, the quality of associations was increased by applying even more restrictive criteria. For P-type onsets no association was used with a larger travel time residual than 4 seconds or a slowness residual of more than 4 s/deg. For the investigated crustal S-type onsets these values were increased to 8 seconds and 8 s/deg respectively, because of larger uncertainty of onset time estimates and larger scatter of observed slowness values for S-type onsets. High frequent noise is often interpreted by the automatic fk-analysis as a teleseismic P-phase. To eliminate these errors high frequency (> 4 Hz) onsets with a ray parameter less than 10 s/deg were not used.

Especially the arrays with a smaller aperture (Apatity, FINESS, and Spitsbergen) had a remarkable number of onsets with large slowness residuals due to lower slowness resolution and less redundancy in the data. In contrast, the array with the largest aperture (GERESS) had the smallest loss of associations due to this point. The influence of high frequency noise was relatively equal for all Scandinavian arrays but neglectable for GERESS due to differences in the detector/SigPro recipes at NORSAR and in Bochum. The restriction to smaller travel time residuals reduced the data for all arrays only slightly.

In summary, these restrictions led to a smaller but more stable set of observed mislocation vectors (compare first and second column in Table 7.5.4). Figure 7.5.1 shows for NORESS all 26 083 used slowness values and gives an impression of the coverage of the slowness space and the scatter of the data. On the top all observed slowness values are seen and at the bottom all corresponding theoretical values are plotted. The circular pattern for large slowness values for the theoretical case (bottom part of figure) is associated with the crustal layering in the IASP91 model.

Mean mislocation vectors

Because of the scatter in single observations it became necessary to calculate mean mislocation vectors. For that the slowness space was divided into 1849 bins and all mislocation vectors were averaged per bin. To divide the slowness space into approximately equally sized areas, the size of the bins varied for different ray parameters between 1 s/deg times 30 deg and 2 s/deg times 5 deg. In this study only mislocation vectors are shown which are based on at least 3 observations in one bin (compare Figs. 7.5.1 and Fig. 7.5.6 which show single observations and mean mislocation vectors for NORESS, respectively). Besides the mean mislocation vectors also corresponding standard deviations were calculated for the observed azimuth and ray parameter values. These standard deviations can be used to weight single observations in further studies. Table 7.5.4 gives for all arrays the mean values of the single mislocation vectors and the mean scatter of the ray parameter and azimuth values before and after applying the slowness corrections. This slowness correction amounts to subtracting the mean mislocation vectors from the observed slowness values within each bin. In comparing columns 3 and 6 of Table 7.5.4 one can see the significant reduction of between 25% and 40% for the mean values of the single mislocation vectors after slowness corrections have been applied.

No explicit relation can be given between observation and theory. So two different types of mislocation vectors can be calculated depending on which slowness value was used as reference for defining the corresponding bin. The first type of vector points from the observations (e.g. as in Fig. 7.5.1 on the top) to the most likely "true" value (the theoretical slowness values shown e.g. in Fig 7.5.1 at the bottom) and the second type points from the theoretical slowness (as in Fig. 7.5.1 at the bottom) to the most likely observed value (i.e. the expected slowness value at the array; see, e.g., Fig 7.5.1 on the top). The latter can predict systematic mislocation errors but not the scatter which is caused by too low slowness resolution or noise. The two types of mislocation vectors are useful for different applications. Figs. 7.5.2 - 7.5.7 show the mislocation vectors for each array. For each figure, the top part shows the observed mislocations (first type) and the bottom part the predicted (second type) mislocations. The symbol size corresponds to the number of single mislocation vectors which were observed per bin and the vectors plotted have to be added to the reference value to get the corrected azimuth and ray parameter.

The figures clearly show that for a sufficient coverage of the slowness space with mislocation vectors a long observing period is needed. This is not only because the seismicity distribution of the Earth is changing by time but also gaps due to station problems must be filled. For the two arrays at Apatity and Spitsbergen which have suffered from problems with data quality and data acquisition, an operation period of about 2.5 years is not long

enough. Unfortunately, these two arrays also have the largest problems with low slowness resolution due to their very small aperture. So the estimation of a sufficient set of mislocation vectors will need several more years of data for these arrays. However, the results for the Apatity array can be used as a first approximation and the results for the Spitsbergen array are shown here for completeness.

Finally, the following question was investigated: How relevant are mislocation vectors that are based on automatically estimated slowness values? At the Institute of Geophysics at Bochum many results of the automatic fk-analysis are reviewed by seismologists, and the values are recomputed following inspection of the data. Such reviewed results are available since April 1991 mostly for P-type onsets with a ray parameter less than 10 s/deg (see Table 7.5.2). For this set of data mislocation vectors can also be estimated and compared with the results for the automatic computations. Fig. 7.5.8 shows these mislocation vectors at the bottom for the reviewed data and on top for the corresponding subset of the automatically estimated data from Fig. 7.5.5. The scatter in the reviewed data is about 8% less (see Table 7.5.4 last two rows). But the main features are very similar in the two plots and the differences between the two mislocation sets are mostly for bins with a small number of observations (smaller symbols). This confirms the use of automatically estimated slowness values in location procedures and shows that the mislocation vectors demonstrated in this paper for small aperture arrays are not the result of some arbitrary processes.

Conclusion

Although a large scatter was observed for single mislocations, mean mislocation vectors could be defined and estimated with their standard deviations for all arrays. These mislocation vectors can now be used regularly to correct automatically estimated slowness and azimuth values. A reduction of the scatter for single observations and a correction for mean mislocation errors is especially needed for single array location routines and for IMS like location algorithms. The predicted mislocation vectors are helpful for estimating better values for the GBF-method. These vectors can also be used to investigate systematic deviations between the used velocity model IASP91 and the velocity structure under the arrays.

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References

Kennett, B. L. N. and E. R. Engdahl (1991): Travel times for global earthquake location and phase identification, *Geophys. Journ. Int.,* 105, 429-466.

Mykkeltveit, S (1992): Mining explosions in the Khibiny Massif (Kola peninsula of Russia) recorded at the Apatity three-component station, Report PL-TR-92-2253, Phillips Laboratory, Hanscom AFB, Ma, USA.

Bulletin	Time period	Number of events	Remarks
ISC	Jan 1, 1989 - Jul 31, 1992	120 716	
PDE monthly	Mar 1, 1990 - Dec 31, 1993	26 484	
PDE weekly	Jan 1, 1994 - Jun 30, 1994	4 905	
Helsinki	Jan 1, 1989 - Jun 30, 1994	3 429	
Bergen	Jan 1, 1989 - Mar 31, 1994	1 319	
Polish mines	Jun 27, 1990 - Jun 12, 1992	418	P. Wiejacz and J. Niewiadomski (both Polish Academy of Sciences, Warsaw) several pers. communications in 1991 and 1992
Bavarian & Czech quarries	Jan 9, 1991 - Oct 14, 1992	285	Compiled at the Institute of Geophysics at Ruhr-University Bochum, supported by several pers. communications with J. Zednik (Czech Academy of Sciences, Praha) in 1992
Kola quarries	Jun 15, 1991 - Oct 23, 1992	195	Mykkeltveit (1992)
Vogtland	Jan 31, 1991 - Nov 16, 1992	74	Bulletin of the Vogtland / Western Bohemian earthquakes, ed. by H. Neunhoefer, University of Jena
Sum	Jan 1, 1989 - Jun 30, 1994	**157 825**	

Table 7.5.1: Contributions of the different bulletins to the list of reference events.

Array	Analyzed time period
Apatity	May 31, 1992 - Jun 30, 1994
ARCESS	Jan 1, 1989 - Jun 30, 1994
FINESS	Nov 23, 1989 - Jun 30, 1994
GERESS	Oct 17, 1990 - Jun 30, 1994
GERESSr	Apr 22, 1991 - Jun 30, 1994
NORESS	Jan 28, 1989 - Jun 30, 1994
Spitsbergen	Nov 23, 1992 - Jun 30, 1994

Table 7.5.2: Time periods of investigated fk-results for the various small aperture arrays. Additionally, for GERESS a data set of analyst-reviewed fk results could be investigated (GERESSr).

Phase	Restrictions
Pg, Sg	del < 10 deg
PgPg, SgSg	4 deg ≤ del < 10 deg; *
Pb, Sb	del < 15 deg
PbPb, SbSb	4 deg ≤ del < 15 deg; *
Pn, Sn	---
PnPn, SnSn	4 deg ≤ del < 18 deg; (SnSn *)
P, pP, sP	---
PcP, ScP	10 deg ≤ del; mag; *
Pdiff	110 deg ≤ del
pPdiff, sPdiff	110 deg ≤ del; if magnitude < 4.0 then *
PKiKP	del ≥ 80 deg
pPKiKP, sPKiKP	del ≥ 80 deg; if magnitude < 4.0 then *
PKP, pPKP, sPKP, SKP	---
PKKP	del ≥ 30 deg; mag; * P'P' mag; *

Table 7.5.3: Phases for which ray parameter and azimuth values were used in this study to estimate the mislocation vectors. For core phases all branches were used (i.e., ab, bc, and df). mag = phase was used only if event magnitude was not lower than 4.0; * = phase was used only if another earlier onset from the same event was observed. del = distance.

Array	No. of detections		Mean scatter			Mean scatter after slowness corrections		
	Asso-ciated	Used	Slow-ness	Ray para-meters	Azim.	Slow-ness	Ray para-meter	Azim.
			[s/deg]	[s/deg]	[deg]	[s/deg]	[s/deg]	[deg]
Apatity	3 654	1 882	2.77	2.24	19.44	1.66	1.51	14.45
ARCESS	42 521	29 738	1.87	1.65	21.83	1.32	1.11	18.99
FINESS	22 798	15 482	2.20	1.79	23.99	1.59	1.28	21.74
GERESS	23 499	17 852	2.00	1.77	23.97	1.47	1.29	20.64
NORESS	34 987	26 083	2.09	1.85	17.01	1.56	1.36	15.58
Spitsbergen	1 267	253	1.89	1.96	27.46	1.25	0.94	22.73
GERESSr		8 000	1.54	1.28	26.97	1.29	1.08	22.91
GERESSa		10 579	1.66	1.40	30.75	1.42	1.16	26.33

Table 7.5.4: Some numerical results of the mislocation study. GERESSr gives the results for analyst-reviewed P-type onsets (ray parameter <= 10 s/deg) and GERESSa is the corresponding subset of the automatically estimated data from GERESS (see text and Fig. 7.5.8).

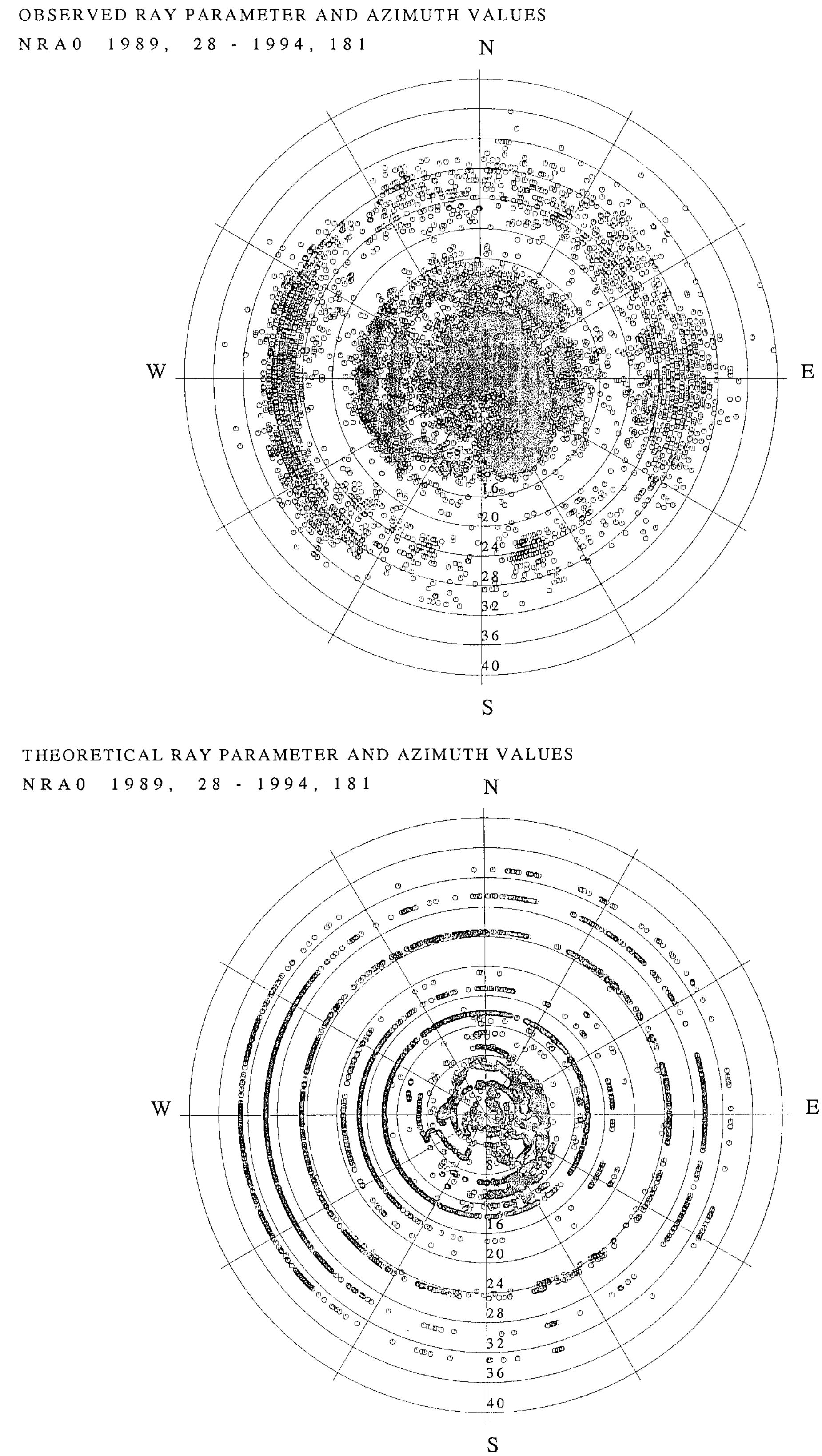
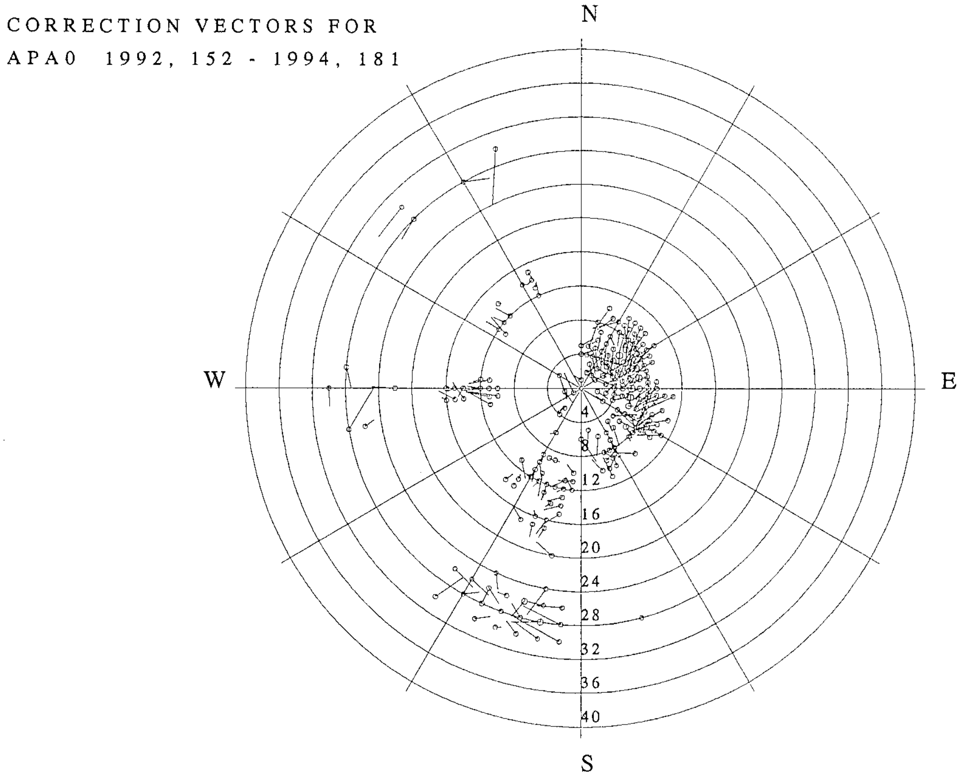


Fig. 7.5.1: The upper plot shows all 26 083 NORESS slowness observations used in this study and at the bottom all corresponding theoretical slowness values are seen.



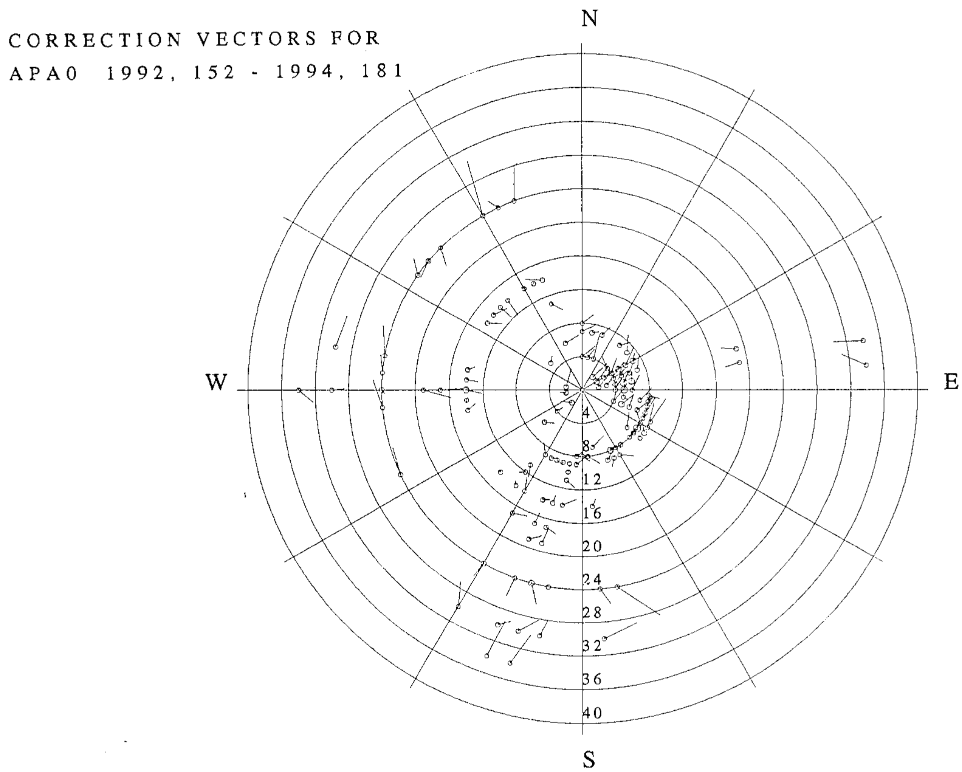


Fig. 7.5.2: The upper plot shows 222 Apatity slowness mislocation vectors relative to the observed values. At the bottom the 134 corresponding mislocation vectors relative to the theoretical values (predicted mislocations) are seen. The symbol size corresponds to the number of single observations per bin. The maximum number of observations per mislocation vector is 25 (top) and 84 (bottom).

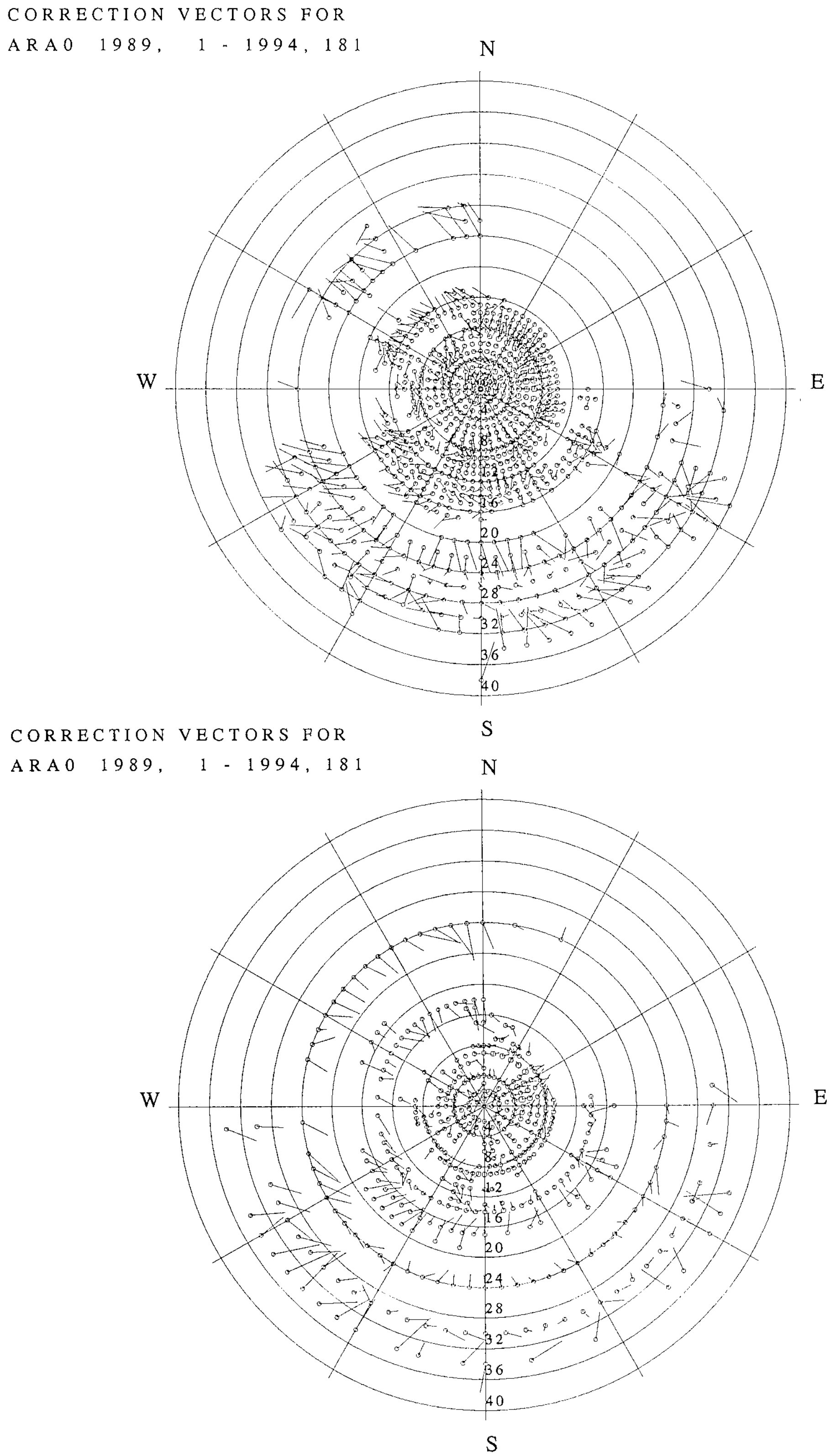


Fig. 7.5.3: As Fig. 7.5.2 but for ARCESS. The number of mislocation vectors is 796 (relative to observation) and 435 (relative to the theory). The maximum number of observations per mislocation vector is 631 (top) and 2419 (bottom).

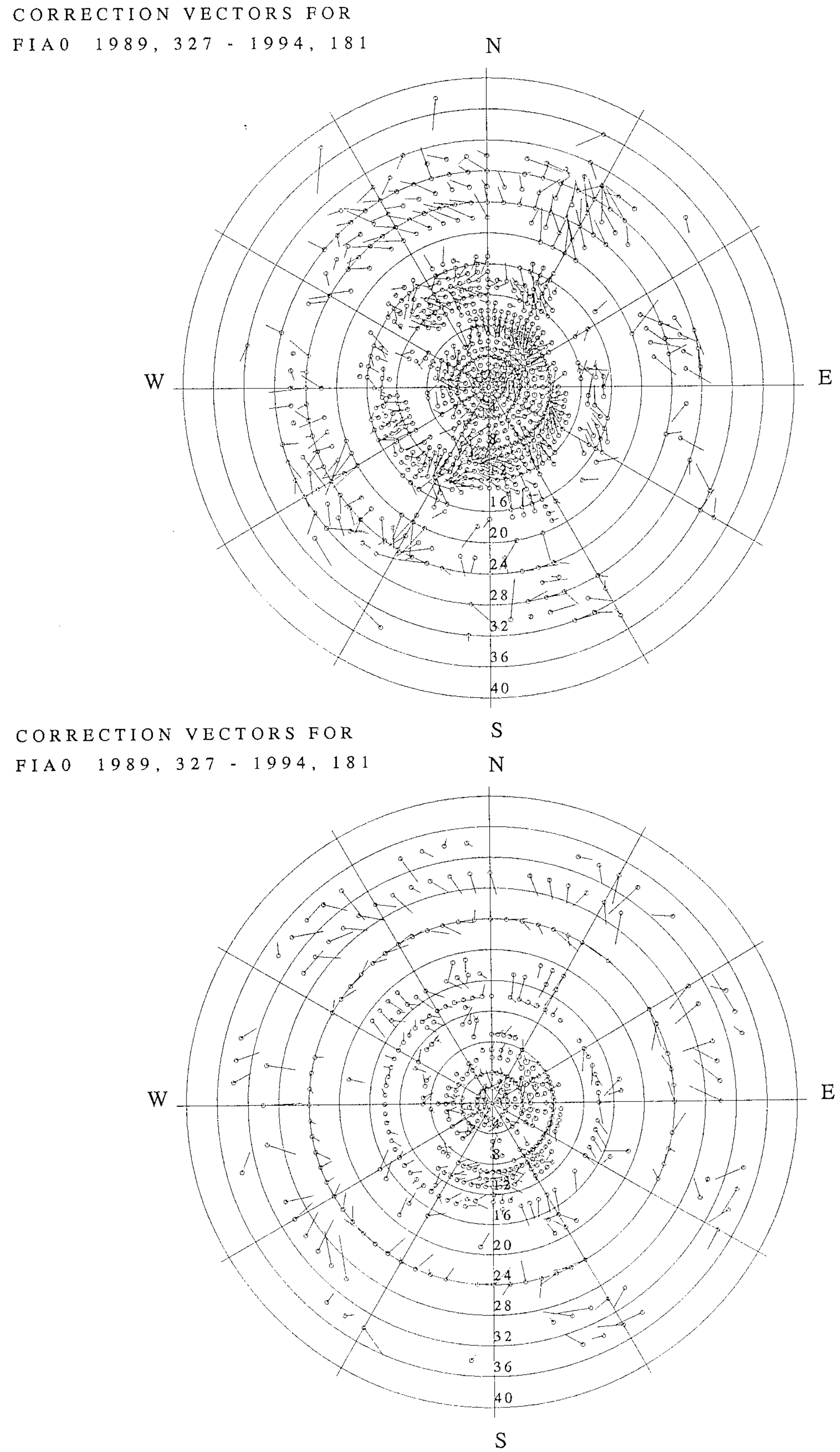
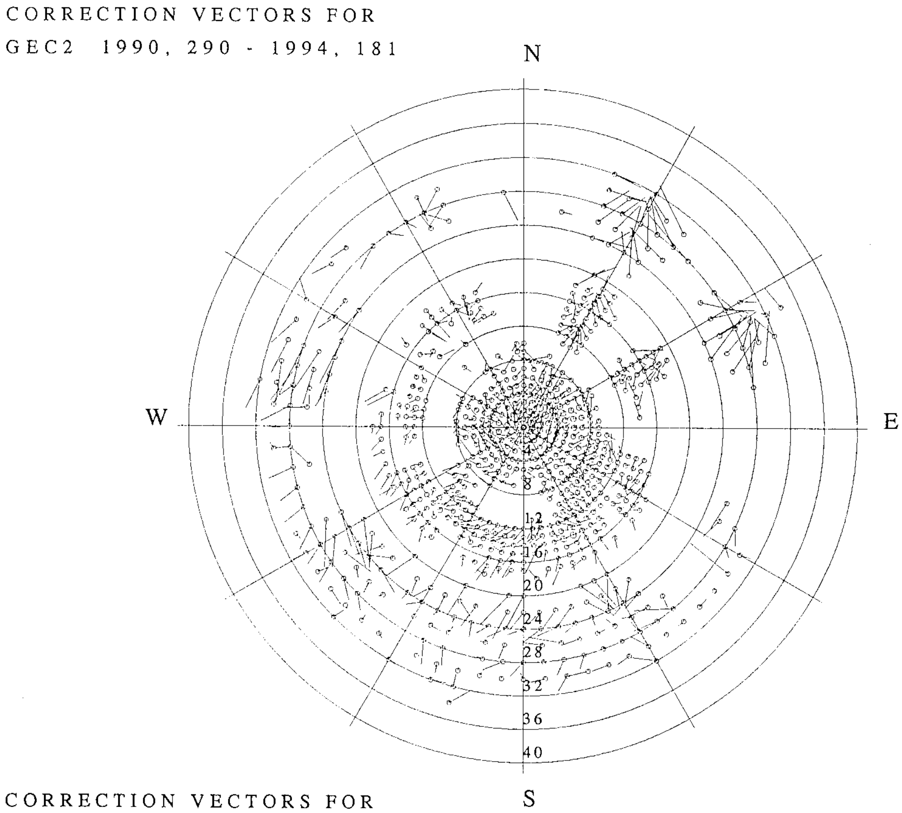


Fig. 7.5.4: As Fig. 7.5.2 but for FINESS. The number of mislocation vectors is 806 (relative to observation) and 446 (relative to the theory). The maximum number of observations per mislocation vector is 298 (top) and 996 (bottom).



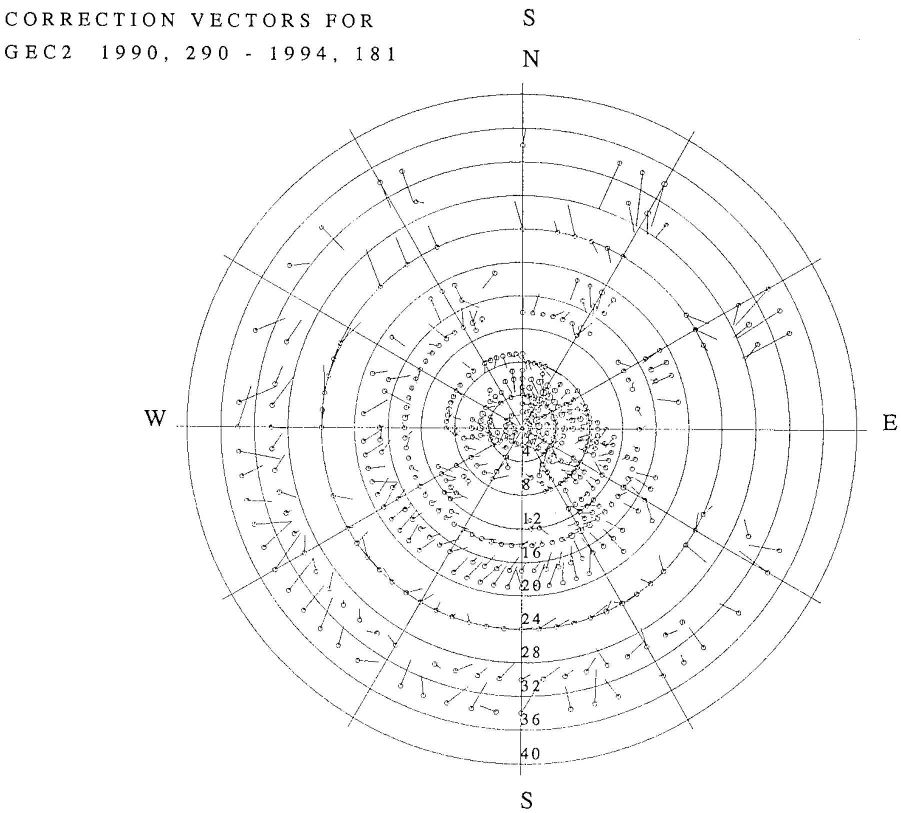


Fig. 7.5.5: As Fig. 7.5.2 but for GERESS. The number of mislocation vectors is 760 (relative to observation) and 469 (relative to the theory). The maximum number of observations per mislocation vector is 325 (top) and 619 (bottom).

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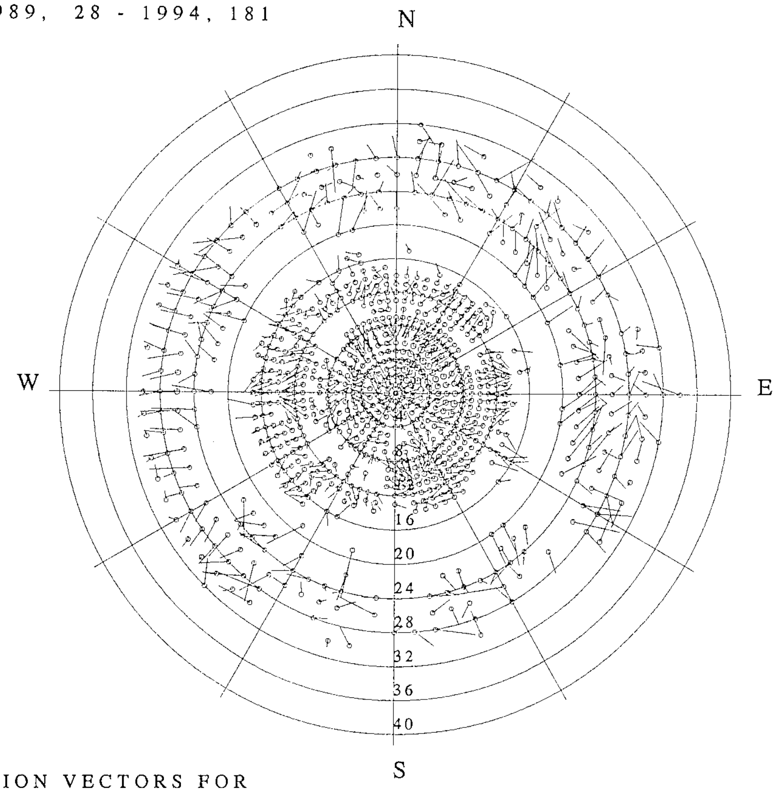


CORRECTION VECTORS FOR
NRAO 1989, 28 - 1994, 181

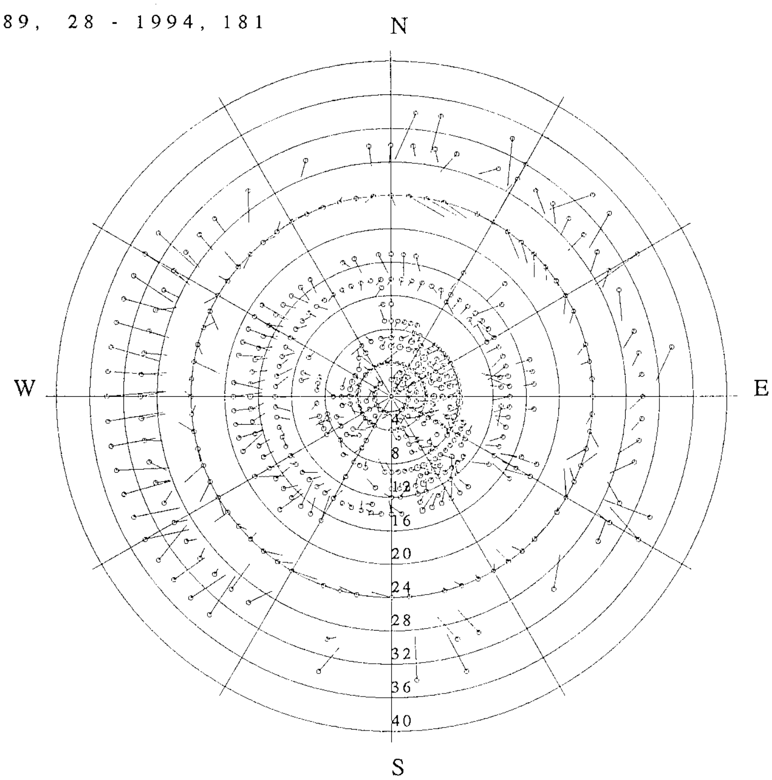
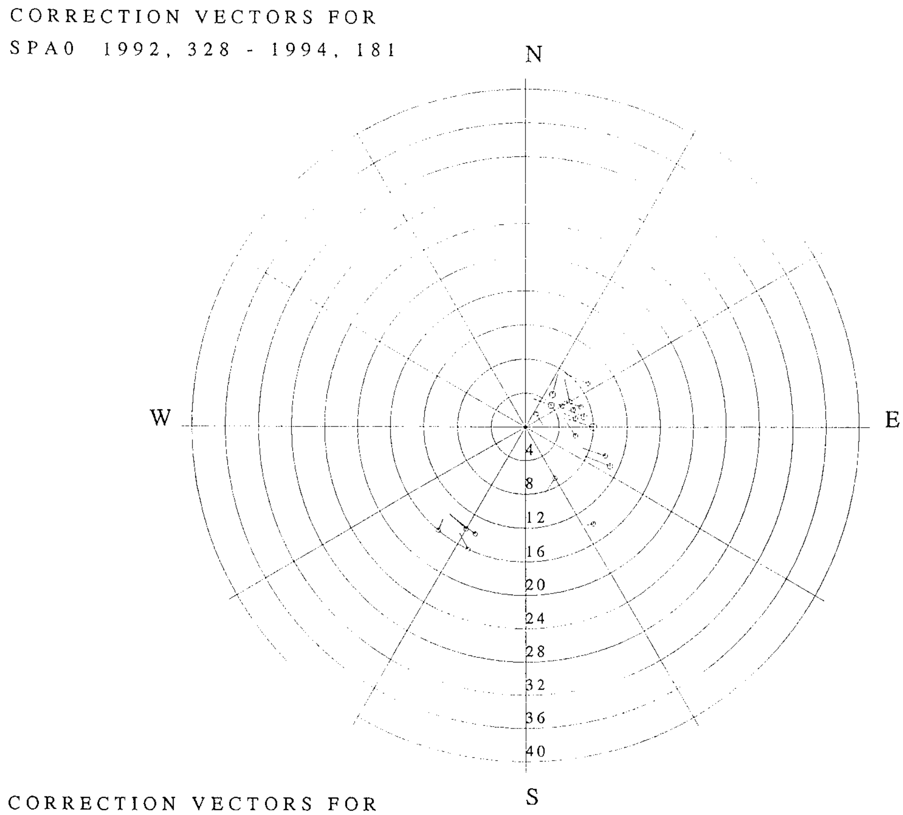


Fig. 7.5.6: As Fig. 7.5.2 but for NORESS. The number of mislocation vectors is 934 (relative to observation) and 497 (relative to the theory). The maximum number of observations per mislocation vector is 614 (top) and 1282 (bottom).



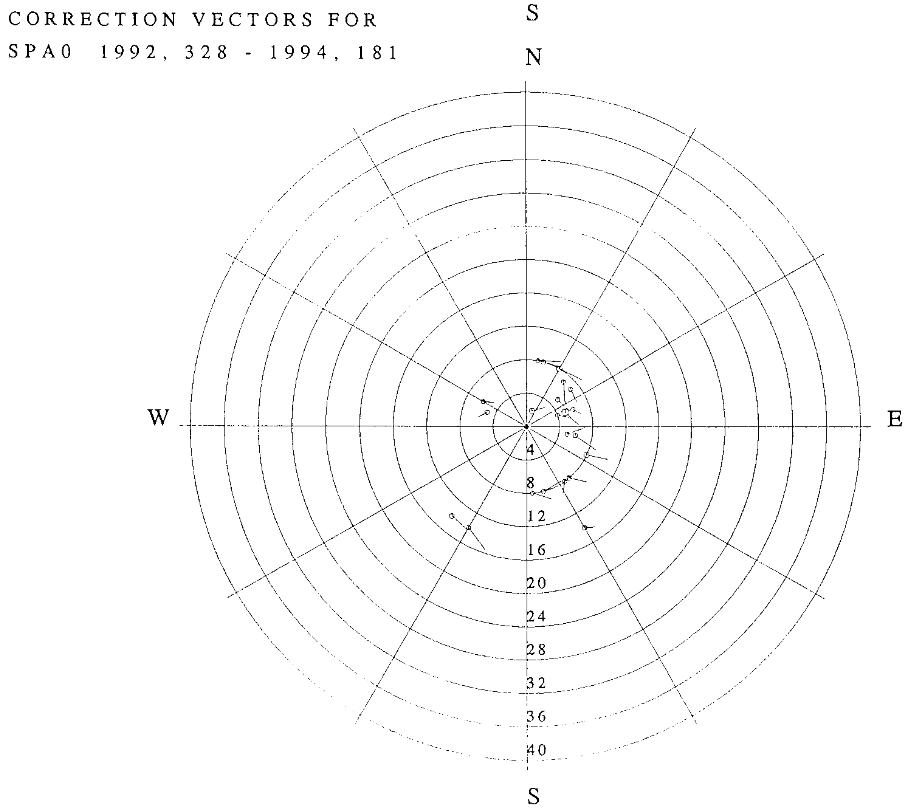
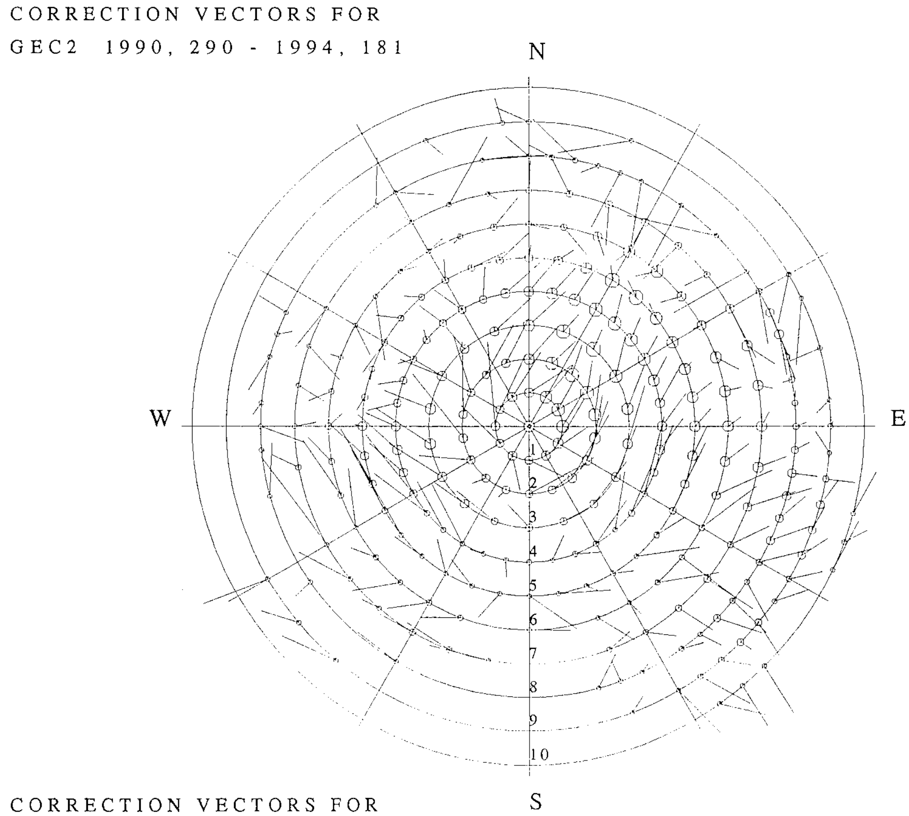


Fig. 7.5.7: As Fig. 7.5.2 but for Spitsbergen. The number of mislocation vectors is 20 (relative to observation) and 22 (relative to the theory). The maximum number of observations per mislocation vector is 6 (top) and 26 (bottom).



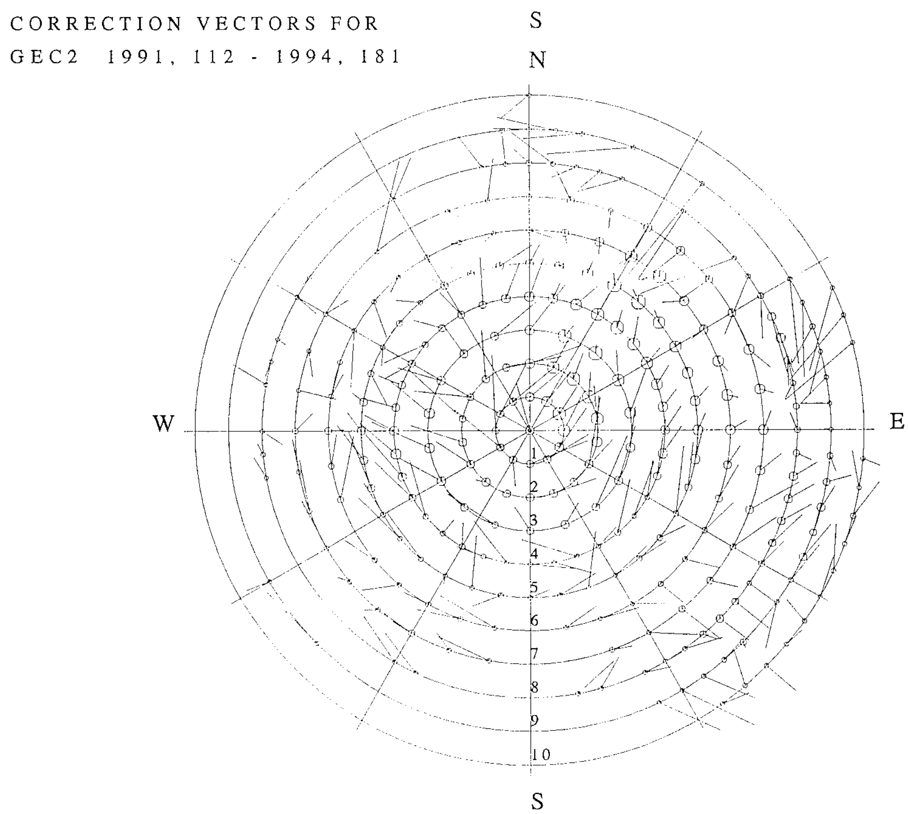


Fig. 7.5.8: Mislocation vectors for GERESS P-type onsets. On the top a subset is shown of the data from Fig. 7.5.5 (top), and at the bottom the mislocation vectors for a collection of GERESS analyst-reviewed slowness values are shown.

7.6 On the reliability of event location estimates from automatic and interactive processing

Introduction

The technique of automatic post-processing of seismic events (Kværna and Ringdal, 1994) has been shown to give a substantial improvement in location accuracy when applied to seismic events in the Khibiny Massif, Kola Peninsula. As shown in that paper (see also Ringdal et al, 1993), the improvement is significant not only relative to automatic processing by the Intelligent Monitoring System (IMS), but also compared to interactive analyst-reviewed solutions.

The improvements are particularly noteworthy since the IMS already shows an excellent location capability in this area (median location error 10.6 km for the automatic solutions and 3.3 km for the analyst-reviewed solutions). By the automatic post-processing method, the median error is reduced to 1.9 km, even when no calibration is carried out. The improvements are even larger when considering the 90% quantile in the location errors; the corresponding numbers being 48.4 km, 9.7 km and 3.6 km for the three cases.

In order to take full advantage of the improved accuracy, it is essential to provide realistic confidence ellipses for the location estimates. In this contribution we discuss the confidence ellipses associated with the various processing methods, and make some observations regarding their reliability as an uncertainty measure. The data base established in the studies described above has been used.

The Khibiny Massif events

Six apatite mines are located within an area of about 10 km^2 in the Khibiny Massif on the Kola Peninsula of Russia (see Fig. 7.6.1). A detailed description of these mines and the mining activity is found in Mykkeltveit (1992). Although we have no explicit information on the exact sizes of these mines, interpretation of various maps suggests that the typical size is about 1 km^2. The Kola Regional Seismological Centre has since the beginning of 1991 provided NORSAR with information on mining blasts in the six Khibiny Massif mines. Detailed information on the events used in this study is given in Kværna (1993).

Data analysis

As reported by Kværna (1993), available data for this study have comprised 4 arrays (NORESS, ARCESS, FINESS, Apatity) as well as the 3-comp Apatity station APZ9. We have considered the location results using four different analysis methods:

1. Automatic IMS analysis, based on available array data (4 arrays)
2. Interactive analyst results using the Analyst Review Station (ARS) (4 arrays + APZ9)
3. Automatic post-processing without calibration (2 arrays: ARCESS and Apatity)

4. Automatic post-processing with calibration (2 arrays + APZ9)

For each event in the data base, we computed the associated 90% confidence ellipse for each of the four methods. For methods 1 and 2, we used the error estimates of time and azimuth provided by the IMS processing system for calculating the error ellipses. As explained by Bache et al (1990), these error estimates take into account both a priori model uncertainties and uncertainties resulting from actual signal-to-noise ratios. For methods 3 and 4, we used error estimates of time and azimuth computed by Kværna (1993). These latter estimates were set to the same value regardless of actual signal-to-noise ratio. An example comparing the uncertainties used for each method is shown for one typical event in Table 7.6.1, using phases from the ARCESS and Apatity arrays.

We then plotted the solutions and the confidence ellipses for all events, as shown in Figs. 7.6.2-7.6.4. For clarity, different colors have been used for each of the six mines, and each figure shows the solutions in two different scales.

Our general observations, also discussed in Ringdal et al (1993), are:

- The interactive IMS solutions (Fig. 7.6.3) are significantly more accurate and consistent than the automatic IMS solutions (Fig. 7.6.2).
- The automatic post-processing solutions are still better than the interactive IMS solutions, even without calibration (Fig. 7.6.4). This is in spite of the fact that post-processing makes use of only 2 arrays.
- With calibration, the results are even more accurate. Fig. 7.6.5 shows the "optimum" results achieved by post-processing with calibrated data, where also the Apatity 3-comp station has been used.

Information on the percentage of events for which the 90% confidence ellipse includes the actual location is given in Table 7.6.2. The following observations are made:

IMS automatic processing:

Only 54% of the error ellipses cover the actual epicenter. This means that these ellipses do not represent the accuracy of the solutions properly.

IMS interactive processing:

93.9% of the error ellipses cover the actual epicenter. Thus the error ellipses are quite representative of the actual accuracy in this case.

Automatic post-processing (uncalibrated):

98.0% of the error ellipses cover the actual epicenter. Thus, the error ellipses are probably too conservative in this case.

Automatic post-processing (calibrated):

90.0% of the error ellipses cover the actual epicenter. Thus the error ellipses represent very well the actual uncertainty for this method.

Conclusions

For the automatic IMS, the error ellipses are currently too small. The main reason is probably that they do not take into account effects of occasional erroneous phase identification by the automatic system. It is noted here that the formal calculation of error ellipses assumes that the phases are correctly identified.

For the interactive IMS solution, the error ellipses are quite representative. This indicates that the a priori uncertainties in the phases used by the location program have been well estimated. Consequently, the interactive IMS solutions have an accuracy that is well represented by their error ellipses, at least for the region processed here.

For the post-processing method using uncalibrated data, it seems necessary to reduce the a priori uncertainties, thus producing smaller error ellipses. With calibrated data, the ellipses are representative for this particular data set. However, it is important that other regions be studied as well before making any firm conclusions.

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T. Kværna

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Kværna, T. (1993): Accurate determination of phase arrival times using autoregressive likelihood estimation, *NORSAR Semiannual Tech. Summ. 1 Oct 1992 - 31 Mar 1993*, Scientific Rep. No. 2-92/93, Kjeller, Norway.

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Mykkeltveit, S. (1992): Mining explosions in the Khibiny Massif (Kola Peninsula of Russia) recorded at the Apatity three-component station. Report PL-TR-92-2253, Phillips Laboratory, Hanscom AFB, MA, USA.

Ringdal, F., T. Kværna and B.Kr. Hokland (1993): Onset time estimation and location of events in the Khibiny Massif, Kola Peninsula, using the Analyst Review Station, NORSAR Semiannual Tech. Summary 1 Apr - 30 Sep 93, Scientific Rep. No. 1-93/94, Kjeller, Norway.

Phase	Method 1 (IMS)		Method 2 (ARS)		Method 3 & 4 (Post-proc.)	
	Time	Az	Time	Az	Time	Az
Apatity Pg	1.0	5.4	1.0	5.4	0.1	-
Apatity Lg	3.0	6.5	3.0	-	0.25	-
Apatity Rg	-	-	3.1	3.2	-	4.0
ARCESS Pn	1.0	6.0	1.0	6.0	0.1	4.0
ARCESS Pg	2.1	5.5	2.1	5.5	-	-
ARCESS Sn	2.1	6.6	2.1	6.6	-	-
ARCESS Lg	3.0	5.5	3.0	5.5	-	-

Table 7.6.1. Example of uncertainties used for calculating error ellipses. Note that the estimates for Methods 1 and 2 are identical. whenever the same phase has been used.

Method	Mine						Total	%
	1	2	3	4	5	6		
IMS automatic	9/11	0/2	7/11	7/12	3/10	1/4	27/50	54.0
IMS interactive	10/11	2/2	10/11	12/12	8/9	4/4	46/49	93.9
Post--processing (uncalibrated)	12/12	2/2	11/11	12/12	9/10	4/4	50/51	98.0
Post-processing (calibrated)	10/11	2/2	11/11	12/12	7/10	3/4	45/50	90.0

Table 7.6.2. Number and percentage of events for which the 90% location confidence ellipse includes the actual epicenter. Numbers are given for each of the 6 mines individually and combined.

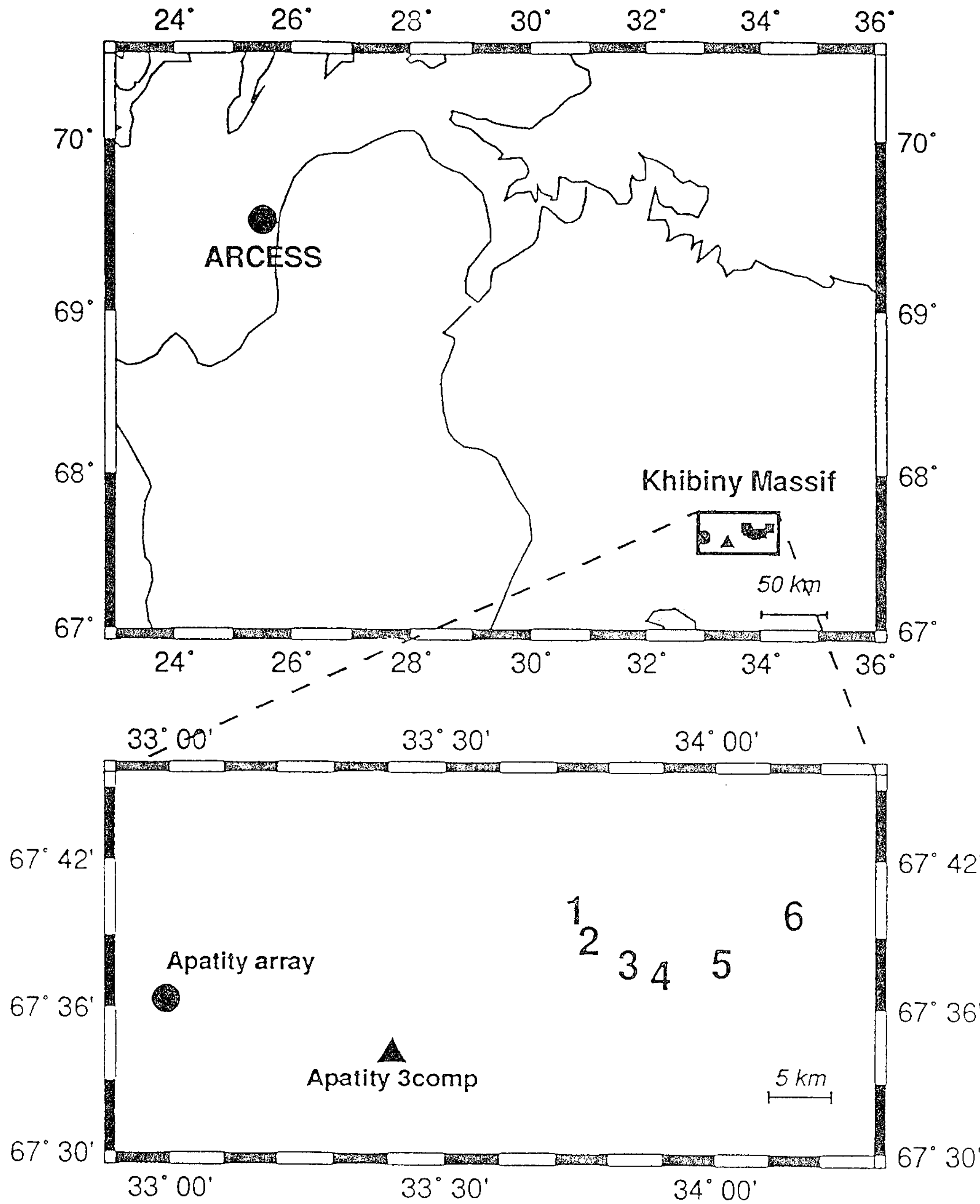

Fig. 7.6.1. In the *upper part*, a large reference area is shown. The location of the ARCESS array is given by a filled circle, and the location of the Khibiny Massif region is shown. The *lower part* shows a detailed picture of the Khibiny Massif region. The locations of the six mining sites are given by large numbers 1-6. The Apatity array (APA0) is shown as a filled circle, and the three-component station (APZ9) in the town of Apatity is shown as a large triangle.

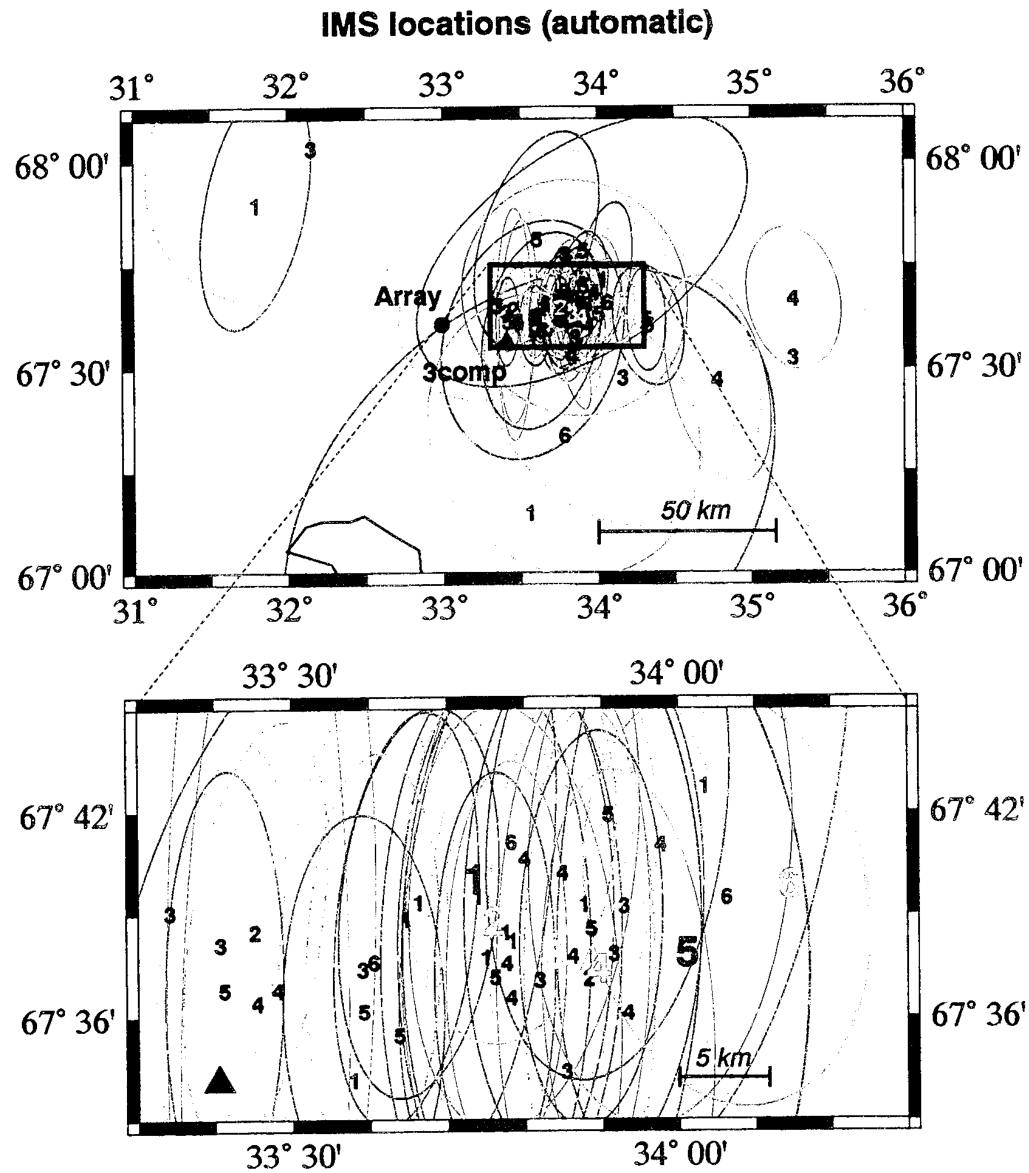

Fig. 7.6.2. Location error ellipses for automatic IMS processed events. The large numbers are actual mining sites, and the small numbers are corresponding location estimates.

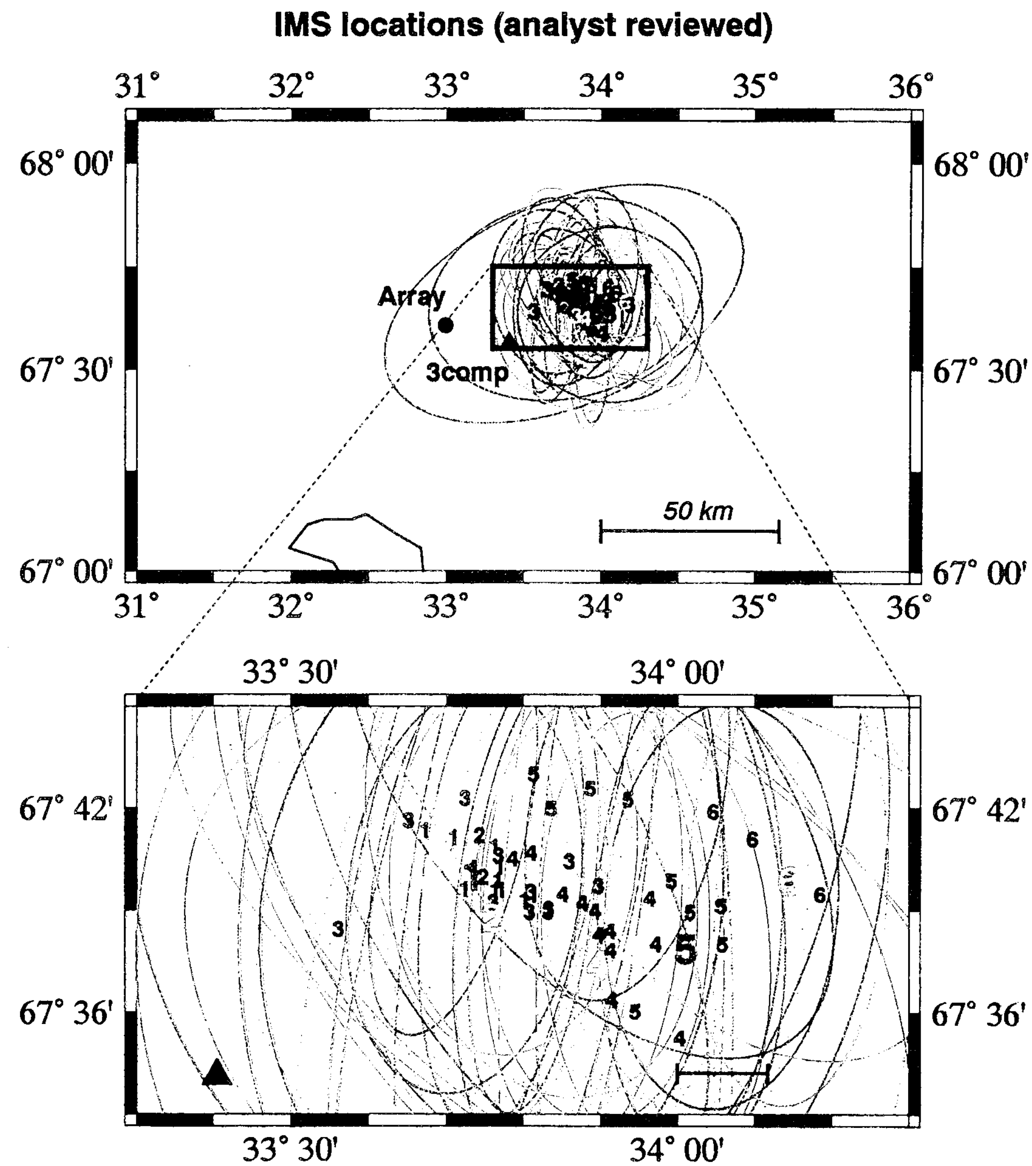

Fig. 7.6.3. Same as Fig. 7.6.2, but corresponding to the IMS analyst-reviewed location estimates.

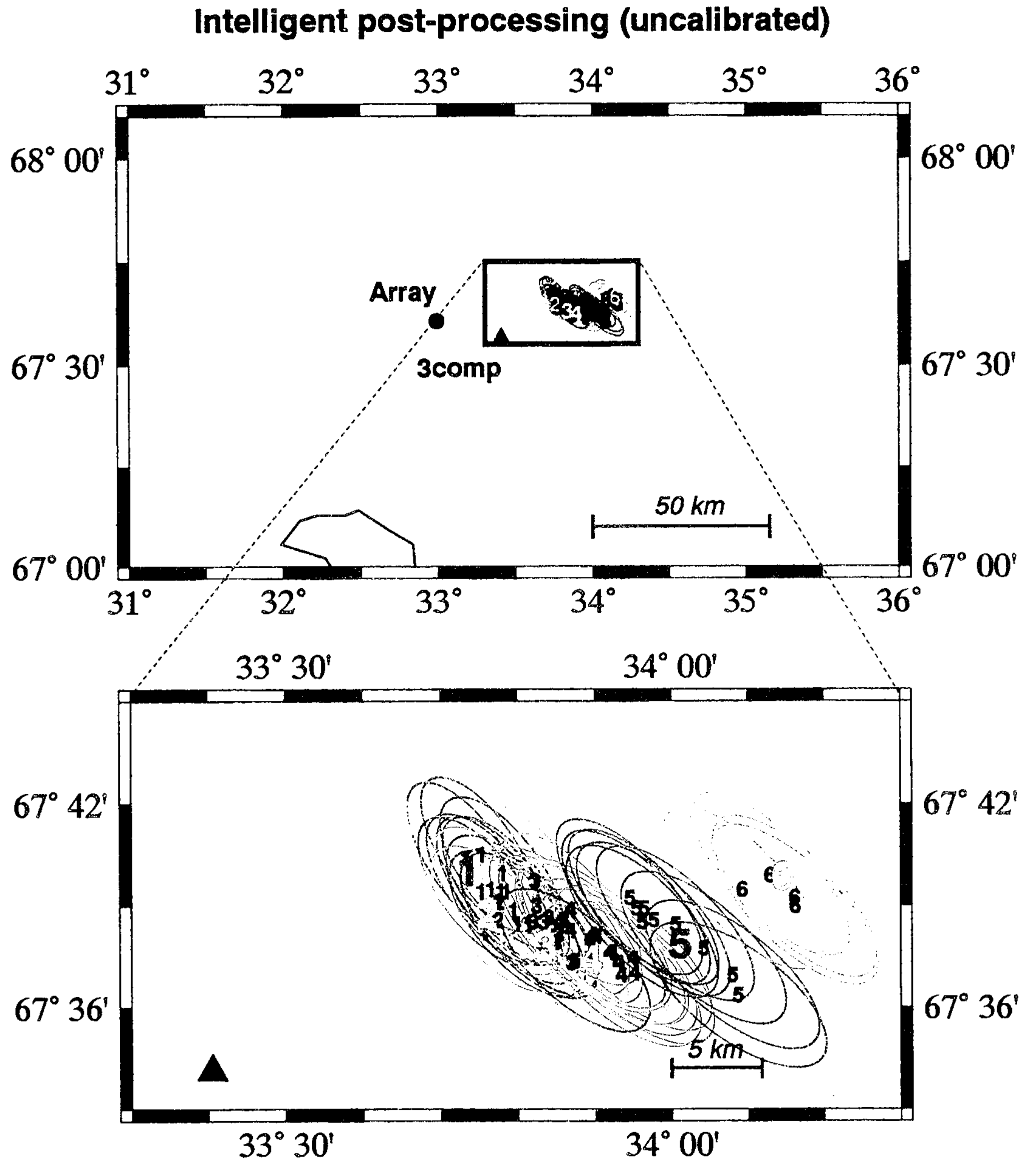

Fig. 7.6.4. Same as Fig. 7.6.2, but corresponding to the automatic post-processing location estimates, using ARCESS and Apatity array data with no calibration.

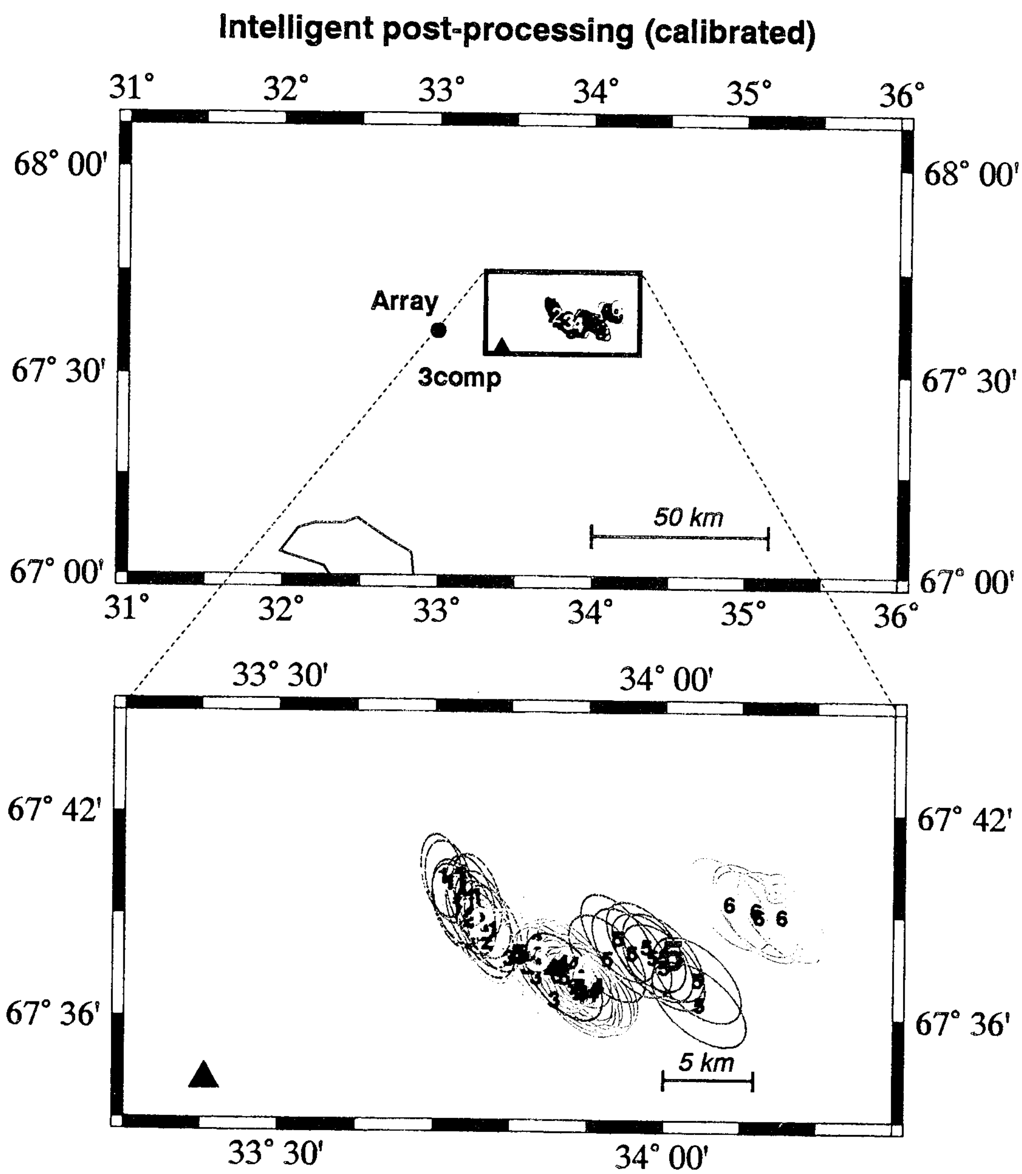

Fig. 7.6.5. Same as Fig. 7.6.2, but corresponding to the automatic post-processing location estimates, using calibrated data from ARCESS, the Apatity array and the Apatity 3-comp station.